THE TWINING LABORATORIES, INC.

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ANALYTICAL CHEMISTRY • ENVIRONMENTAL SERVICES
GEOTECHNICAL ENGINEERING • SAMPLING SERVICES
CONSTRUCTION INSPECTION & MATERIALS TESTING

January 23, 2006 D05094.02-03

Home Depot U.S.A., Inc.
c/o Scott A. Mommer Consulting, Land Development Service
4630 West Jacquelyn Avenue, Suite 119
Fresno, CA 93722

Attention: Mr. Art Lucas

Subject: **Descriptions of Compaction Grouting and Stone Column Methods for Ground Improvement: Proposed Home Depot, SS00341 19101 Magnolia Street Huntington Beach, California**

Dear Mr. Lucas:

At your request, this letter was prepared to provide descriptions of compaction grouting and stone column methods for ground improvement at the proposed Home Depot site in Huntington Beach, California, and is subject to the terms and limitations expressed in the project geotechnical report and the agreement for professional services between Home Depot and Twining.

The following descriptions have been provided to summarize the equipment and procedures for two (2) alternative methods being considered for deep ground improvement to reduce the potential impacts from liquefaction related settlements for the proposed Home Depot structure at the subject site. In addition, a summary of the potential vibration and noise impacts to adjacent properties is discussed. It is our understanding the following descriptions will be used by the Home Depot design team to evaluate which method of ground improvement would result in the least impact to adjacent properties.

General Description of Equipment and Procedures used for Compaction Grouting Techniques for Liquefaction Mitigation

In brief, compaction grouting involves the injection of cement grout under high pressures at individual locations over an evenly spaced grid pattern across the entire building area and beyond. The purpose of the grout injection is to laterally densify the loose soils which are susceptible to seismic settlement and thereby decrease the liquefaction and seismic settlement potential of the densified layers. For liquefaction mitigation, this process typically involves construction of compaction grout locations on a uniform square-grid pattern of about 6 to 10 feet on center. This treatment is conducted to a depth necessary to densify the soils that are subject to liquefaction over a plan area that includes the entire building footprint and areas of adjacent appurtenances. For this project, the treatment area is anticipated to be about 150,000 square feet (this should be confirmed by the project civil engineer).

CORPORATE	MODESTO	CORONA	BAKERSFIELD	MONTEREY	SACRAMENTO
2527 Fresno Street	5253 Jerusalem Court, Suite E	840 East Parkridge Avenue, Suite 104	3651 Pegasus Drive, #117	501 Ortiz Avenue	5675 Power Inn Road, Suite C
Fresno, CA 93721-1804	Modesto, CA 95356-9322	Corona, CA 92879	Bakersfield, CA 93308-6843	Sand City, CA 93955	Sacramento, CA 95824
(559) 268-7021	(209) 342-2061	(951) 898-8932	(661) 393-5088	(831) 392-1056	(916) 381-9477
Fax 268-7126	Fax 579-1480	Fax 898-8974	Fax 393-4643	Fax 392-1059	Fax 381-9478

Compaction grout involves installation of a grout pipe into the subsurface soils. The grout pipe is generally installed by a combination of drilling and driving a steel casing into the ground. The casing is then used as a conduit for the grout pipe to inject grout from the bottom of the casing at high pressures up to the top of the soil layer to be densified. The grout pipe is slowly raised from the ground as the grout is injected, so that the pressure used to force the grout into the ground induces lateral compaction effort to the subsurface soils. At the completion of an individual compaction grout column, subsequent columns are constructed throughout the process until all columns are installed and the required densification is obtained.

The equipment used to extend the grout pipe into the ground is a specialized unit that typically has the appearance of a crane or a bull dozer with a frame attachment used to mechanically or hydraulically advance the grout pipe and / or casing. For the purposes of this letter, this equipment is referred to as the injection rig. Heavier injection rigs are generally required as the depth of ground improvement increases. Due to the depth of the ground improvement required for this site, the injection rig equipment demands will be high. In order to pump the grout at the high pressures required, a large air compressor is generally used.

Based on the total volume of grout anticipated for this project, the grout will be mixed in an onsite batch plant, which will include silos of cement and stockpiles of aggregate (sand and gravel) and water supply. The batch plant will mix the cement grout, which consists of water, cement and aggregate. Equipment such as a front end loader and cement mixing equipment are used for proportioning and mixing the cement grout. The cement grout will then be pumped through hoses to the location of the injection rig, through the grout pipe and into the ground. Supporting equipment often includes a generator, drill rig, tractor-trailers, air supply tank and air compressors.

General Description of Equipment and Procedures used for Stone Columns Installation for Liquefaction Mitigation

The Stone Column technique for soil densification consists of compaction of aggregate (i.e, sand and gravel) into underlying site soil strata. Compaction of the aggregate results in densification of the surrounding soil strata using specially designed equipment. For liquefaction mitigation, this process typically involves construction of stone columns on a uniform, square-grid pattern of about 8 to 10 feet on center.

The Stone Column equipment consists of a base machine which includes a low frequency vibratory hammer, aggregate hopper, casing pipe, and lifting bucket, that is fed aggregate by a front end loader. The base machine looks similar in appearance to a crane such as those used for pile driving. Additional equipment includes a generator, air supply tank, and air compressor that are usually mounted to the base machine.

The operating procedure consists of positioning the base machine in the location of the proposed column, inserting the casing pipe below the ground surface to the required depth, and starting construction of the stone column. The casing pipe is then loaded with aggregate, the casing pipe is inserted below the ground surface to the desired depth, and the aggregate is released through the bottom of the casing pipe into the ground by using compressed air. The casing pipe is then vertically raised approximately ten (10) feet, allowing the aggregate to drop into the resulting void space. The casing pipe is then vibrated and pushed into the newly placed aggregate, thereby compacting the aggregate and densifying the surrounding soil. This process is repeated until the column is constructed throughout the treatment depth. Upon completion of one column, subsequent columns are installed until all columns are completed and the desired densification is obtained.

Summary of Noise and Vibration Impacts

The intent of the following summary is to discuss the potential for noise and vibration impacts to adjacent properties for further evaluation by a specialist in this field. The impacts discussed herein are not intended to address impacts caused to workmen within the limits of the subject property. It is our understanding the proposed Home Depot property is bordered by a mix of residential and commercial property. Based on information provided by the project civil engineers (Lars Andersen), the proposed Home Depot structure is located about 160 feet from the adjacent Blockbuster retail store and about 60 feet from the property line bordering a residential development. It is our understanding no structures are located within about 75 feet of the proposed Home Depot (LA to confirm). Based on the limits of the deep ground improvement recommended in the geotechnical report, the source of the machinery generating the highest noise and/or ground vibrations is not anticipated to be closer than 50 feet from the nearest property line during production. The following summary of potential noise and vibration impacts has been prepared based on this understanding.

As with any construction activity, noise is generated during activities such as compaction grouting and stone column installation. The noise levels are generally attributed to the actual equipment type rather than the ground improvement method (i.e., depending on the equipment used, compaction grouting may be noisier, or stone column installation may be noisier). As a result of the variables surrounding both construction types, it is difficult to project which process will be louder. In addition, although one method may generate lower noise emissions than another, the quieter method may require a greater duration to complete, thereby extending the duration of the construction noise generation.

During the compaction grouting and stone column installation, ground vibrations are induced when the casing is driven and / or pushed into the ground and ground vibrations in areas adjacent to air compressors occur. Comparatively, ground vibrations are also induced during compaction of the stone columns. In our experience, the ground vibrations generated at the source from compaction grouting are less than when compared with conventional stone column techniques. However, vibration levels reduce with increased distance from the source of the vibration. Given the distance of the work area from the property line, the perceptible vibration levels from typical equipment used to install stone columns may not be greater than typical equipment used for compaction grouting.

We appreciate the opportunity to be of service to Home Depot U.S.A., Inc. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience.

Sincerely,

THE TWINING LABORATORIES, INC.

REGISTERED GEOLOGIST
KENNETH JAMES CLARK
No. EG 1864
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Kenneth J. Clark, CEG
Engineering Geologist
Geotechnical Engineering Division

GEOLOGY & SOILS

Letter from Twining Laboratories, Inc.

THE TWINING LABORATORIES, INC.
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CONSTRUCTION INSPECTION & MATERIALS TESTING

January 12, 2006

D05094.02-02R

Home Depot U.S.A., Inc.
3800 West Chapman Avenue
Orange, CA 92868

Attention: Mr. Bob Burnside

Subject: **Geotechnical Engineering Investigation Report Clarification**
Proposed Home Depot, SS00341
19101 Magnolia Street
Huntington Beach, California

Reference: The Twining Laboratories, Inc. Geotechnical Engineering Investigation Report dated November 23, 2004, Project No. D05094.02

Dear Mr. Burnside:

As requested, this letter has been prepared to clarify: 1) the depth of engineered fill recommended below foundations, and 2) the methods recommended for foundation support for the proposed Home Depot store to be located at 19101 Magnolia Street in Huntington Beach, California.

Depth of Engineered Fill Below Foundations

The Executive Summary of the geotechnical report, states: "*...new foundations should be supported on at least 2 feet of engineered fill to reduce the anticipated static settlements to 1 inch total and ½ inch in 50 feet differential.*"

It is our understanding a clarification of the minimum depth of fill below foundations is desired. The intent of this recommendation is to provide 2 feet of engineered fill below the bottom of new foundations to reduce the potential for excessive differential static settlements. The report states "... at least 2 feet ..." to account for additional fill that may be placed below the foundations if the elevation of the site were to be modified by placement of fill soils, i.e., if the site were raised or cut. The use of the term "minimum" also provides a clarification to contractors bidding the project that at least 2 feet of engineered fill is required for the project. By stating that at least 2 feet is required, the contractors are informed that less than 2 feet is not satisfactory; however, if the contractor inadvertently over-excavated 2 feet and 1 inch due to the nature of earthwork operations this would be acceptable since the minimum depth of engineered fill was achieved. It is our understanding that no significant fill or cut is planned as part of the proposed development.

Accordingly, proposed foundations may be supported on 2 feet of engineered fill. The proposed foundations will not be required to be supported on more than 2 feet of engineered fill unless the finish floor elevation of the proposed building is raised.

In addition, the report recommends at least 2 feet of non-expansive fill below the slab-on-grade due to the expansive nature of the on-site soils. Again, the intent of this recommendation is to provide no less than 2 feet of non-expansive engineered fill below the new slab-on-grade to reduce the potential for excessive differential movements and swell. The report indicates " . . . at least 2 feet . . . " to account for additional fill that may be placed below the slab-on-grade if the elevation of the site were to be modified by placement of fill soils, i.e., if the site were raised or cut. The use of the term "minimum" also provides a clarification to contractors bidding the project that at least 2 feet of non-expansive engineered fill is required below the slab-on-grade for the project. By stating that at least 2 feet is required, the contractors are informed that less than 2 feet is not satisfactory; however, if the contractor inadvertently places 2 feet and 1 inch of non-expansive fill due to the nature of earthwork operations this would be acceptable since the minimum thickness of non-expansive engineered fill was achieved. It is our understanding no significant fill or cut is planned as part of the proposed development. Accordingly, the proposed slab-on-grade may be supported on 2 feet of non-expansive engineered fill. The proposed foundations will not be required to be supported on more than 2 feet of non-expansive engineered fill.

Foundation Support

As discussed in the geotechnical engineering investigation report, the subsurface soils exhibit the prerequisite conditions for liquefaction and excessive seismic settlements. These characteristics are similar to geotechnical conditions within the Huntington Beach area and many other low lying coastal areas of Southern California. Given the potential for excessive seismic settlements, two (2) methods of foundation support were considered for this site: 1) a deep foundation system, i.e., driven piles, etc.; and 2) densification of the native soils using a deep ground improvement method and support of shallow foundations on engineered fill.

Based on our evaluation of the two methods, the ground vibration and noise impacts resulting from construction of a deep foundation system (i.e., driven piles) would, in our opinion, likely be greater than the impacts from the implementation of a deep ground improvement program completed using compaction grouting, "stone" column techniques, etc. Accordingly, based on discussions with multiple specialty geotechnical contractors, a deep ground improvement was recommended for support of a shallow foundation system for this site as compared with a deep foundation system consisting of driven piles. The final geotechnical engineering investigation report will include recommendations and specifications for the type of deep ground improvement for this site. The method selected will be chosen based on several parameters including reducing the potential impacts to adjacent properties related to noise and vibration that will result for the ground improvement operations, and the duration of the construction or implementation. The method selected will also be based on the effectiveness of the ground improvement technology considering the subsurface soil conditions. The final geotechnical engineering investigation report will also include vibration and noise criteria developed to reduce the impact on the adjacent properties. The geotechnical engineering investigation report will require that the contractor comply with these criteria during the deep ground improvement program to limit the potential impacts to adjacent properties from noise and vibrations. Finally, the site will be monitored during the ground improvement operations to verify that the contractor complies with the allowable criteria specified in the final geotechnical engineering investigation report.

Conclusions

In conclusion, the proposed foundations will not be required to be supported on more than 2 feet of non-expansive engineered fill. However, if the contractor inadvertently places more than 2 feet of non-expansive fill due to the nature of earthwork operations this would be acceptable since the minimum thickness of non-expansive engineered fill was achieved.

In conclusion, a deep ground improvement program has been recommended for support of a shallow foundation system for this site. The deep ground improvement was selected to reduce the noise and vibration impacts as compared with other alternative methods of foundation support such as a deep, driven pile foundation system.

Closing

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally-accepted engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

We appreciate the opportunity to be of service to Home Depot U.S.A., Inc. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience.

Sincerely,

THE TWINING LABORATORIES, INC.

Harry D. Moore, RCE, RGE
President

RA/HDM

cc: Lars Andersen and Associates, Inc.; Attention Mr. Art Lucas

THE TWINING LABORATORIES, INC.
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DRAFT

GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED HOME DEPOT, SS00341

19101 MAGNOLIA STREET

HUNTINGTON BEACH, CALIFORNIA

Project Number: D05094.02-01

For:

Home Depot U.S.A., Inc.
3800 West Chapman Avenue
Orange, CA 92868

November 23, 2004

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GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED HOME DEPOT, SS00341

19101 MAGNOLIA STREET

HUNTINGTON BEACH, CALIFORNIA

Project Number: D05094.02

1.0 INTRODUCTION

This report presents the results of a geotechnical engineering investigation for the proposed Home Depot store to be located at 19101 Magnolia Street, on the southwest corner of Magnolia Street and Garfield Avenue, in Huntington Beach, California. The Twining Laboratories, Inc. (Twining) was authorized by Mr. Scott Mommer to perform the initial geotechnical engineering investigation and by Mr. Robert Burnside to perform the supplemental geotechnical engineering investigation.

The contents of this report include the purpose of the investigation and the scope of services provided. The site history, previous studies, existing site features, and anticipated construction are discussed. In addition, a description of the investigative procedures used and the subsequent findings obtained are presented. Finally, the report provides an evaluation of the findings, general conclusions, and related recommendations. The three report appendices contain the drawings (Appendix A), the logs of borings and CPT soundings (Appendix B), and the results of laboratory tests (Appendix C).

The Geotechnical Engineering Division of Twining, headquartered in Fresno, California, performed the investigation.

2.0 PURPOSE AND SCOPE OF INVESTIGATION

2.1 Purpose: The purpose of the investigation was to conduct a field exploration, a laboratory testing program, evaluate the data collected during the field and laboratory portions of the investigation, and provide the following:

2.1.1 Evaluation of the near surface soils within the zone of influence of the proposed foundations, exterior slabs-on-grade, and pavements with regard to Home Depot design criteria;

2.1.2 Conclusions regarding the potential for liquefaction, magnitude of seismic settlement, and recommendations for CBC seismic near source factors and coefficients;

2.1.3 Geotechnical parameters for use in design of foundations and slabs-on-grade, (e.g., soil bearing capacity and settlement), and development of lateral resistance;

2.1.4 Recommendations for site preparation including placement, moisture conditioning, and compaction of engineered fill soils;

2.1.5 Recommendations for the design and construction of new asphaltic concrete (AC) and Portland cement concrete (PCC) pavements;

2.1.6 Evaluation of pavement overlay alternatives;

2.1.7 Recommendations for temporary excavations and trench backfill; and

2.1.8 Conclusions regarding soil corrosion potential.

This report is provided specifically for the proposed Home Depot store referenced in the Anticipated Construction section of this report.

This investigation did not include a floodplain investigation, compaction tests, environmental investigation, or environmental audit.

2.2 Scope: Our proposed scopes of work, dated June 6, 2004 and September 16, 2004, outlined the scope of our services. It was not the intent of this investigation to fully comply with the Home Depot Design Manual requirements for the number of borings on the site (21 borings in the building area and on a 100-foot grid across the entire site). As agreed initially with Mr. Scott Mommer and, later, with Mr. Burnside, the intent of this investigation was to perform at least twenty-one (21) borings and CPTs in the proposed Home Depot store building area, including the overbuild zone, as well as several additional test borings in the parking lot area. The actions undertaken during the investigation are summarized as follows.

2.2.1 The Home Depot Store Geotechnical Investigation Requirements, National Edition (Part Two dated January 9, 2004), was reviewed.

2.2.2 A Site Plan for the proposed project, prepared by Scott A. Mommer Consulting, dated July 26, 2004, was reviewed.

2.2.3 The following civil plans, prepared for the Kmart Store #4424 by Psomas & Associates, were reviewed:

- Grading
- Architectural Survey
- Proposed Parking Lay-Out

These plans are referred to, hereinafter, as the Kmart Civil Plans.

2.2.4 A set of structural plans, prepared by Coogan & Walters Commercial Developers, dated September 25, 1970, for Kmart store #4424, were reviewed. These plans are referred to, hereinafter, as the Kmart Structural Plans.

2.2.5 The Seismic Hazard Zone Report 003, prepared by the California Department of Conservation, Department of Mines and Geology, dated April 17, 1997, including a map showing seismic hazard zones (Newport Beach Quadrangle), and highest historic groundwater level contours, was reviewed.

2.2.6 The City of Huntington Beach Building Code (last revision October 2002) was reviewed.

2.2.7 A visual site reconnaissance and subsurface exploration were conducted.

2.2.8 Laboratory tests were conducted to determine selected physical and engineering properties of the subsurface soils.

2.2.9 Mr. Robert Burnside (Home Depot U.S.A., Inc.), Mr. Scott Mommer (Scott A. Mommer Consulting) and Mr. Juan Baez (Consultant) were consulted during the investigation.

2.2.10 The data obtained from the investigation were evaluated to develop an understanding of the subsurface soil conditions and engineering properties of the subsurface soils.

2.2.11 This report was prepared to present the purpose and scope, background information, field exploration procedures, findings, evaluation, conclusions, and recommendations.

It should be noted that the scope of work did not fully comply with the Home Depot requirements for new store construction as discussed and agreed with Home Depot. In addition, some aspects of the proposed scope had to be modified due to restrictions posed by the existing improvements.

3.0 BACKGROUND INFORMATION

The site history, previous studies, existing site features, and the anticipated construction are summarized in the following subsections.

3.1 Site Description: The project site comprises approximately 9.16 acres located at 19101 Magnolia Street, on the southwest corner of Magnolia Street and Garfield Avenue, in Huntington Beach, Orange County, California. A site location map is presented on Drawing No. 1 in Appendix A. The site was bound to the north by a Taco Bell Restaurant, Magnolia Street, and an apartment complex beyond; to the west by a Blockbuster Store, Garfield Avenue and single family residences beyond; to the east by an existing retail development; and to the south by single family residences.

At the time of the field explorations conducted in June 2004 and November 2004, the project site was occupied by an existing Kmart store building and attached automotive center, garden shop, associated asphaltic concrete (AC) parking areas, drive areas, and landscape areas. Underground utilities, including electric, telephone, water, irrigation, sewer, and storm drain lines, were noted throughout the site. Existing hydraulic lifts were observed in the area of the automotive center in July of 2004. It is anticipated that a grease interceptor is present in the area of the existing Kmart food court. Also, a vapor extraction well system was observed on the adjacent property, north of the existing Blockbuster Store.

According to the Grading Sheet of the Kmart Civil Plans, the site elevations ranged from 9.5 feet above mean sea level (AMSL) in the southeast portion of the site to 12.5 feet AMSL along the perimeter of the Kmart store building.

3.2 Site History: At the time of the supplemental field exploration in November 2004, the project site was occupied by an existing Kmart store building, including existing asphaltic concrete parking and drive areas associated with the store. The store was not in business operation at the time of the field exploration.

It was assumed that the original construction occurred in the early 1970's. The store was remodeled in the late 1980's or early 1990's. Based on this information, the building and site improvements were estimated to be between approximately 15 and 35 years old.

3.3 Previous Studies: At the time of the preparation of this report, the design level geotechnical report for the existing Kmart store was not available. The Kmart Structural Plans reference a report prepared by Sladden Engineering, dated December 8, 1969. If this report or any other prior geotechnical engineering, geological, or environmental studies conducted for this site become available, these reports should be provided for review and consideration for this project.

The foundation notes on the structural plans for the original construction state the following:

2. Type of footings:

Spread footings on compacted fill or recompacted existing soils.

3. Design soil pressure:

Isolated column footings: 2,000 p.s.f.
Continuous footings: 1,500 p.s.f.

4. Minimum embedment of footings:

1'-6" below adjacent grade or top of slab.

3.4 Existing and Anticipated Construction

3.4.1 Existing Kmart: The original Kmart store building comprises about 116,824 square feet in plan dimensions at the approximate location shown on the site plan, Drawing No. 2 in Appendix A.

In brief, the existing building is a single-story structure with a mezzanine, with concrete masonry unit (CMU) block walls, a combination of steel and wood frame roof, and concrete slab-on-grade floors. Review of the Kmart structural plans indicates that the structure is supported by a shallow spread foundation system. The thicknesses and reinforcement of the building slabs indicated on the foundation plan of the Kmart Structural Plans are summarized in Table No. 1.

Table No. 1
Thicknesses and Reinforcements of the Kmart Store Building Slabs

Location of the Slab	Thickness of the Slab, inches	Reinforcement
Kmart Store Supplies Storage Room	6	10 gauge wire mesh spaced 6 inches by 6 inches
Automotive Center and Loading Dock South of Kmart Truck Well	6	# 3 rebar spaced 18 inches each way
Truck Wells	8	# 3 rebar spaced 18 inches each way
Kmart Store and Sales Areas	4	10 gauge wire mesh spaced 6 inches by 6 inches

The Grading Plan of the Kmart Civil Plans indicates a finish floor elevation of 13.0 feet for the existing building. The foundation plan of the Kmart Structural Plans indicates that the slab in the automotive center is depressed 5½ inches.

3.4.2 Proposed Home Depot: The proposed Home Depot development includes demolition and removal of the existing Kmart Building, underground utilities, hardscapes and parking and drive areas within the overbuild zone. It is our understanding the existing pavements will be replaced with new pavements. The development will include a new Home Depot store building and garden center as indicated on the July 26, 2004 Site Plan. The site plan indicates that the Home Depot store and garden center will occupy about 102,513 square feet and 34,643 square feet in plan dimensions, respectively. The approximate locations of the proposed Home Depot store and garden center are shown on the site plan, Drawing No. 2 in Appendix A. The Home Depot store is anticipated to be a single-story building consisting of CMU or concrete tilt-up walls and a combination wood and steel frame roof with a concrete slab-on-grade floor. The development will also include underground utilities, and paved parking and drive areas. In addition, the proposed development will include demolition and reconstruction of the existing pavements.

Maximum loads for the proposed Home Depot store of 5 kips per lineal foot for bearing walls, 120 kips for columns, and a slab-on-grade live load of 650 pounds per square foot were specified by the Home Depot Design Criteria Manual. Tolerable total and differential settlements due to anticipated dead plus live loads of 1-inch and ½-inch in 50 feet, respectively, were stipulated by the Design Manual for the purpose of design.

The proposed development will include driveways and parking for automobile and truck traffic. Equivalent 18 kip axle loads (EAL) of 50,000 and 220,000 for a design life of 10 years were indicated in the Design Manual for the Home Depot "standard duty" and "heavy duty" pavement sections, respectively.

The finished floor elevation for the proposed Home Depot Store is anticipated to be at or near the finished floor elevation of the existing Kmart building (13.0 feet AMSL). Earthwork cuts and fills up to 3 feet are anticipated to establish design grades and to provide positive site drainage. These estimates do not include additional over-excavation required to provide engineered fill below the foundations as recommended in this report.

4.0 INVESTIGATIVE PROCEDURES

The field exploration and laboratory testing programs conducted for this investigation are summarized in the following subsections.

4.1 Field Exploration: The field exploration consisted of a site reconnaissance, drilling test borings, coring the existing concrete slabs-on-grade, soil sampling, standard penetration tests, and cone penetrometer test (CPT) soundings.

Drawing No. 2 in Appendix A.

The CPT soundings were performed by Kehoe Testing and Engineering using an electronic piezocone with a 60-degree apex angle and a diameter of 35.7 millimeters (about 1½ inches) hydraulically advanced using a 30-ton CPT rig in accordance with ASTM Test Method D3441. CPT measurements of cone bearing resistance, sleeve friction, and dynamic pore water pressure were recorded at 0.25 foot intervals during penetration to provide nearly continuous logs of the soil behavior types. The CPT logs are presented in Appendix B.

CPT sounding locations were determined by pacing with reference to the southwest corner of the existing Kmart store building. The locations, as shown on Drawing No. 2 (Appendix A), should be considered accurate to within 5 feet. The sounding holes were backfilled with bentonite chips.

4.1.4 <u>Soil Sampling</u>: Standard penetration tests were conducted in the test borings, and both disturbed and relatively undisturbed soil samples were obtained.

The standard penetration resistance, N-value, is defined as the number of blows required to drive a standard split barrel sampler into the soil. The standard split barrel sampler has a 2-inch O.D. and a 1⅜-inch inside diameter (I.D.). The sampler is driven by a 140-pound weight free falling 30 inches. The sampler is lowered to the bottom of the bore hole and set by driving it an initial 6 inches. It is then driven an additional 12 inches and the number of blows required to advance the sampler the additional 12 inches is recorded as the N-value.

Relatively undisturbed soil samples for laboratory tests were obtained by pushing or driving a California modified split barrel ring sampler into the soil. The soil was retained in brass rings, 2.5 inches O.D. and 1-inch in height. The lower 6-inch portion of the samples were placed in close-fitting, plastic, airtight containers which, in turn, were placed in cushioned boxes for transport to the laboratory. Soil samples obtained were taken to Twining's laboratory for classification and testing.

4.1.5 <u>Concrete Slabs-On-Grade Coring</u>: On June 17, 2004, the existing Kmart store interior slab was cored at four locations. The concrete cores were returned to our laboratory in order to determine the thickness of the cores and the approximate size and location of reinforcement.

4.2 <u>Laboratory Testing</u>: The laboratory testing was programmed to determine selected physical and engineering properties of the soils underlying the site. The tests were conducted on disturbed and relatively undisturbed samples representative of the subsurface materials.

The results of laboratory tests are summarized on Figure Numbers 1 through 27 in Appendix C. These data, along with the field observations, were used to prepare the final test boring logs in Appendix B.

4.1.1 **Site Reconnaissance**: The site reconnaissance consisted of walking the site and noting visible surface features. The reconnaissance was conducted by Mr. Dean Ledgerwood on June 17, 2004 and Mr. Hatim Elbadri (both of Twining) on November 4, 2004. The features noted are described in the background information.

4.1.2 **Drilling Test Borings**: The depths and locations of test borings were selected based on the size of the structure, type of construction, estimated depths of influence of proposed foundation loads, and the subsurface conditions.

On June 17, 2004, four (4) test borings were drilled inside the existing Kmart store and automotive center to depths of 18 to 25 feet BSG. The test borings inside the existing Kmart building included coring the floor slab and excavating soil borings using a limited access drill rig. On June 17, 2004, six (6) test borings were drilled in the area of the proposed Home Depot store (outside the exiskting building), and parking and drive areas associated with the existing Kmart store to depths of between 11 ½ and 50 feet BSG. On November 4, 2004, six (6) supplemental test borings were drilled in the area proposed for the Home Depot store and nine (9) supplemental test borings were drilled in the parking lot area. Soil samples were collected and returned to our laboratory for classification and testing. The exterior test borings (outside the existing building) were drilled using a CME-75 drill rig equipped with 6⅝-inch outside diameter (O.D.) hollow-stem augers. The interior test borings were drilled using a limited access drill rig equipped with 6-inch O. D. solid-flight augers. The test borings were drilled under the direction of a Twining staff geologist. The soils encountered in the test borings were logged. The field soil classification was in accordance with the Unified Soil Classification System and consisted of particle size, color, and other distinguishing features of the soil.

The presence and elevation of free water, if any, in the borings were noted and recorded during drilling and immediately following completion of borings.

Test boring locations were determined by pacing with reference to the southwest corner of the existing Kmart store building. The locations, as described, should be considered accurate to within 5 feet. The locations of the test borings are described on the boring logs in Appendix B. Elevations of the interior building test borings were not surveyed as a part of the investigation, however, they were interpreted from the Kmart Civil Plans. The test borings were loosely backfilled with bentonite chips or bentonite grout; thus, some settlement should be anticipated in the boring locations.

4.1.3 **Cone Penetration Test (CPT) Soundings**: In addition to the hollow stem auger borings, cone penetration testing (CPT) was performed at the site. On June 16, 2004, six (6) CPT soundings were advanced to depths of 25 to 50 feet BSG in the area proposed for the Home Depot store. On November 12, 2004, six (6) supplemental CPTs were performed to depths of approximately 50 feet BSG. CPT methods were used to obtain nearly continuous soil behavior type and penetration resistance information for use in liquefaction evaluation. The soundings were conducted under the direction of a Twining staff geologist. The CPT locations are shown on

5.0 FINDINGS AND RESULTS

The findings and results of the field exploration and laboratory testing are summarized in the following subsections.

5.1 Condition of Interior Slabs-on-Grade: Visual observations of the interior slabs-on-grade revealed numerous cracks in the slabs-on-grade in areas that were exposed (no floor covering). The cracks observed in the store slab exhibited an "alligator" pattern with lengths in the 6 to 10 inch range. These cracks appear to be shrinkage cracks.

The existing Kmart store interior slabs-on-grade were cored to determine the slab thicknesses at several locations. The test locations are shown on Drawing No. 2 in Appendix A. The thicknesses of the slab at the coring locations are summarized in Table No. 2.

Table No. 2
Interior Slabs-On-Grade - Summary of Core Tests

Test Boring Designation	Location	Average Core Thickness, inches *	Location of the 0.18-inch wire reinforcement, inches below top of the slab *
B-1	Northeast Portion of the Building	5.9	3.6
B-2	Southeast Portion of the Building	4.8	3.7
B-3	Kmart Store Supplies Storage Room	6.4	5.5
B-4	Automotive Center	5.5	NE

* Note: Measurements made to the nearest 1/10- inch using a micrometer.
NE Not encountered

It should be noted that sand layers, vapor barriers, or aggregate base sections were not encountered in any test boring drilled at the site.

5.2 Exterior Slabs-On-Grade: Longitudinal cracks up to 20 feet long and up to ¼ inch wide were observed in the garden center and front sidewalk slabs (area adjacent to the garden center).

5.3 Asphaltic Concrete Pavements: The asphaltic concrete pavements appeared to be in poor condition. Numerous "alligator" cracking and potholes in the pavement were observed throughout the parking and drive areas. During the test boring excavation, the thicknesses of the asphaltic concrete and aggregate base were determined at each location. The thicknesses are recorded on the logs of boring included in Appendix B of this report.

5.4 **Soil Profile:** In general, the soils encountered consisted of interbedded layers of silty sands, poorly graded sands, sandy silts, and lean clays to the maximum depth explored, 50 feet BSG. The near surface soils consisted predominantly of silty sands and sandy silts.

These subsurface soil descriptions constitute a general summary of the soil conditions encountered in the test borings drilled and the CPT soundings conducted for this investigation. Detailed descriptions of the soils encountered at each test boring are presented on the logs of borings in Appendix B. The stratification lines shown on the logs represent the approximate boundary between soil types; the actual in-situ transition may be gradual.

5.5 **Soil Engineering Properties:** The silty sand soils encountered between the ground surface and 15 feet BSG were very loose to medium dense as indicated by standard penetration resistance, N-values, ranging from 4 to 21 blows per foot. The natural moisture content of the soils ranged from about 9 to 35 percent above the groundwater table. The soils exhibited high compressibility characteristics with the addition of moisture as indicated by consolidation testing. Upon inundation, the soils exhibited slight to moderate collapse potential when saturated under a 2 kips per square foot confining load.

The silty sand soils, encountered predominantly between the depths of 15 to 50 feet BSG, were loose to medium dense as indicated by N-values ranging from 8 to 12 blows per foot. The natural moisture contents of the soils ranged from about 26 to 30 percent below the groundwater table.

The sandy silt soils encountered between the ground surface and a depth of about 15 feet BSG were soft to medium stiff as indicated by N-values ranging from 3 to 8 blows per foot. The natural moisture contents of soils ranged from 10 to 39 percent above the groundwater table. A maximum density/optimum moisture determination performed on one near-surface soil sample indicated a maximum dry density of 119.8 pounds per cubic foot at an optimum moisture content of 11.9 percent. The soils exhibited low compressibility characteristics with the addition of moisture as indicated by consolidation testing. Upon inundation, the soils exhibited low collapse potential. The results of one (1) expansion index test indicates that the near surface silts are expansive (UBC EI = 47, classified as low expansion per UBC Table 18-1-B).

The sandy silt soils encountered between depths of 15 and 50 feet BSG were medium stiff to stiff as indicated by N-values ranging from 8 to 11 blows per foot. The natural moisture contents of the soils ranged from 30 to 34 percent below the groundwater table.

The poorly graded sands were loose to medium dense as indicated by N-values ranging from 5 to 21 blows per foot. The natural moisture contents of the soils ranged from 3 to 31 percent and from 23 to 37 percent below the groundwater table. The soils exhibited high compressibility characteristics with the addition of moisture as indicated consolidation testing. Upon inundation, the soils exhibited moderate collapse potential.

The lean clay soils encountered were soft to very stiff as indicated by N-values ranging from 2 to 17 blows per foot. The natural moisture content of soils ranged from 25 to 60 percent below the groundwater table.

R-value tests were conducted on six (6) near surface samples collected between the depths of approximately ½ and 3½ feet BSG. The results of the tests indicate R-values of 20, 24, 27, 29, 44 and 62.

Chemical tests performed on two (2) near surface soil samples indicated pH values of 7.7 for both samples, minimum resistivity values of 2,600 and 2,100 ohms/centimeter, 0.018 and 0.019 percent by weight concentrations of sulfate, and 0.0061 and 0.0044 percent by weight concentrations of chloride.

5.6 <u>Groundwater Conditions</u>: Groundwater was encountered in nine (9) of the ten (10) test borings drilled for the investigation. Groundwater depths ranged from 9 to 18 feet BSG at the time of the field exploration (June and November 2004), with the exception of one (1) test boring which encountered some groundwater seepage at a depth of 5 feet (at the location of test boring B-24 in the parking lot on the east side of the existing building). The shallow depth to water at this location (B-24) is anticipated to be a localized zone of perched groundwater. Interpolation of groundwater level contours indicated on Plate 1.2 of the Seismic Hazard Zone Report 003, prepared by the Division of Mines and Geology, indicates an historic high groundwater level of 4 feet below the surface for the area of the site.

A groundwater depth of 4 feet or less should be used by the design professionals for purposes of design. The Contractor should use a groundwater depth of 4 feet or less for bidding purposes.

It should be recognized, however, that water table elevations fluctuate with time, since they are dependent upon seasonal precipitation, irrigation, land use, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered both during the construction phase and the design life of the project. The evaluation of such factors was beyond the scope of this investigation and report. A groundwater depth of 9 feet was used in the liquefaction and seismically induced settlement evaluations.

6.0 <u>EVALUATION</u>

The data and methodology used to develop conclusions and recommendations for project design and preparation of geotechnical related construction specifications are summarized in the following subsections. The evaluations were based upon the subsurface conditions determined from the investigation, our review of the project site plan, and our understanding of the proposed construction. The conclusions obtained from the results of our evaluations are described in the Conclusions section of this report (Section 7.0). Twining should review the grading plans (when available). The grading could significantly impact our evaluations and recommendations for this site. A summary of the evaluations performed as a part of this report are described below.

6.1 **Expansive Soils:** One of the geotechnical concerns evaluated at this site is the expansion potential of the near surface soils. Over time, expansive soils will experience cyclic drying and wetting as the dry and wet seasons pass. Expansive soils experience volumetric changes (shrink/swell) as the moisture content of the clayey soils fluctuate. These shrink/swell cycles can impact foundations and lightly loaded slabs-on-grade when not designed for the anticipated expansive soil pressures. Expansive soils cause more damage to structures, particularly light buildings and pavements, than any other natural hazard, including earthquakes and floods (Jones and Holtz, 1973). Expansion potential may not manifest itself until months or years after construction. The potential for damage to slabs-on-grade and foundations supported on expansive soils can be reduced by placing non-expansive sections underlying foundations and slabs-on-grade.

In consideration of the expansive soils at the site, expansion testing was performed on representative samples of the near surface soils which are anticipated to be within the zone of influence of planned improvements. The expansion testing was performed in accordance with UBC Standard 29-2. The soils tested were classified by expansion potential in accordance with UBC Table 18-1-B and are summarized in Appendix C of this report.

At most sites there exists a depth to which the moisture content of the subgrade remains essentially constant throughout the year; thus, expansive soils would not be expected to undergo a significant volume change below this depth. This depth is referred to as the "critical depth." This depth influences the selection of suitable foundation and floor slab alternatives. Climatic conditions, groundwater conditions, irrigation, and soil type affect the critical depth.

Since most of the site will be covered with buildings and pavements, which should impede moisture fluctuations, it is expected that the post-development critical zone will be about 24 inches BSG at this site.

Foundations should be extended to a depth of at least the post construction critical depth to limit the influence of the seasonal moisture fluctuations. In addition, the foundations should extend to the critical depth below finished grades around the entire perimeter of the building, including doorways, so that the perimeter foundations can act as a lateral cutoff for migration of moisture. Some of the adverse effects of expansive soils can be reduced, not eliminated, by supporting the slabs-on-grade on imported non-expansive granular engineered fill. Recommendations for placing imported non-expansive soils below slabs are provided in the Recommendations section of this report.

6.2 **Static Settlement and Bearing Capacity of Shallow Foundations:** The potential for excessive total and differential static settlements of foundations and slabs-on-grade is a geotechnical concern which should be evaluated for this building site. The increases in effective stress to underlying soils which can occur from new foundations and structures, placement of fill, withdrawal of groundwater, etc. can cause vertical deformation of the soils, which can result in damage to the overlying structure and improvements. The differential component of the settlement is often the most damaging. In addition, the allowable bearing pressures of the soils supporting the foundations should be evaluated for shear and punching type failure of the soils resulting from the imposed foundation loads.

Based on the subsurface data and laboratory testing performed as part of this report, static settlement calculations were performed. Calculations indicate that static settlement of foundations placed directly on native soils at the proposed foundation depth would exceed the Home Depot design criteria for differential settlements of ½ inch in 50 feet. To reduce the estimated static total and differential settlements to 1 inch and ½ inch in 50 linear feet, respectively, the foundations would need to be supported on a uniform thickness of engineered fill (a minimum of 2 feet below the bottom of foundations).

Total and differential static settlements due to combined anticipated foundation loads of 1-inch and ½-inch in 50 feet, respectively, were estimated considering: 1) the compressibility of the native soils following the recommended site preparation; 2) the structural loads anticipated, and 3) the use of a maximum allowable net bearing pressure of 2,000 pounds per square foot for dead-plus-live loads.

Net allowable soil bearing pressure is the additional contact pressure at the base of the foundations caused by the structure. The weight of the soil backfill may be neglected and the weight of concrete in the footings may be assumed to be 50 pounds per cubic foot. The net allowable soil bearing pressure presented was selected to satisfy both the settlement criteria and Terzaghi bearing capacity equations for spread foundations. A factor of safety of 3 was used to determine the allowable bearing capacity based on the Terzaghi equations.

6.3 <u>Interior Slab on Grade Construction:</u> As indicated above, the potential for damage to slabs due to expansive soils should be addressed by placing a non-expansive section below slabs-on-grade. In addition, several issues need to be considered to limit the potential for damage to slabs during construction. These issues include: 1) using perimeter pour-strips at tilt-up and CMU wall locations to avoid damage to slab-wall connections; 2) differential slab movement at interior columns; 3) aggregate base sections below the slabs, and 4) crane and construction equipment loads on the slabs.

Depending on the sequence of slab loading and the location of wall construction, damage to slabs from differential loading conditions could occur. It has been our experience that a concentrated amount of differential movement and damage at the slab-to-perimeter footing location can occur as heavy load bearing walls are placed and the footing is loaded. This typical procedure can result in cracking of slabs and foundations due to differential movement. This potential damage can be reduced by leaving a perimeter pour strip between the wall footing and the adjacent slabs. After the walls are erected, and a majority of the static movement has occurred, the pour strip can be placed.

The method of interior column construction can also potentially damage the overlying slabs. In some cases, the subgrade preparation for the slab is not continuous across the top of spread footings. Often the zone above the top of structural footings is backfilled with concrete during slab placement. This results in a differential slab support condition which often causes cracking at the soil/base-to-concrete transition. This crack appears as an outline of the underlying footing at the floor surface. The potential for this type of slab cracking can be reduced by backfilling the zone above the top of the footing and below the bottom of slabs with an approved backfill material and/or an aggregate base section below the floor slab. This procedure will provide uniform support for the slabs which should reduce the potential for cracking.

It has been our experience that placing concrete for the concrete slabs by the tailgating method can cause subgrade instability due to the high frequency of concrete trucks which travel across the prepared subgrade. Compacted subgrade can experience instability under high traffic loads resulting in heaving and depressions in the subgrade during critical pours. This condition becomes more critical during wet winter and spring months. A layer of aggregate base (AB) can reduce the potential for instability under the high frequency loading of concrete trucks. Also, the improved support characteristics of the AB can be used in the design of the slab sections. Therefore, it is recommended to utilize a slab design with at least 6 inches of AB for constructability and design purposes.

Finally, it is expected that erection of concrete tilt-up wall panels and roof steel will require cranes and heavy construction equipment. It should be noted that cranes and heavy construction equipment can impart intense loads on slabs and pavements. The loaded track pressure of cranes and/or heavy construction equipment that will operate on slabs or pavements should be assessed by the contractor prior to placing equipment on the slab.

6.4 **Faulting and Ground Rupture:** The project site is not located in an Alquist-Priolo Earthquake Fault Zone. The nearest known active or potentially active fault is the Newport - Inglewood Fault (L. A. Basin segment) located about 1.6 miles (2.8 km) northeast of the site. Due to the distance to the nearest mapped fault, the potential for fault rupture at the site is considered low.

6.5 **Seismic Coefficients and Near Source Factors:** It is our understanding that the 2001 CBC will be used for structural design, and that seismic site coefficients are needed for design. Based on the 2001 CBC Table 16A-J, the site is classified as a stiff soil S_D site with standard penetration resistance N-values averaging between 15 and 50 blows per foot in the upper 100 feet BSG.

The site coefficients for acceleration and velocity are based on the distance and activity of the local faults. Digitized seismic models published by the CGS indicate that three (3) faults or fault segments are located within 15 kilometers of the site. These faults are: L. A. Basin Segment of the Newport - Inglewood Fault (distance approximately 2.8 km, M_m= 6.9, slip rate 1.0 mm/year), the Compton Thrust Fault (distance approximately 9.3 km, M_m= 6.8, slip rate 1.5 mm/year), and the Offshore

Segment of Newport - Inglewood Fault (distance approximately 11.7 km, M_m= 6.9, slip rate 1.5 mm/year). According to Table 16A-U - Seismic Source Type, these faults are considered to be type B seismic sources; therefore, the site requires near-source corrections (CBC Tables 16A-S and 16A-T). The values of the near-source acceleration factor, Na, and the near-source velocity factor, Nv, may be taken as 1.2 and 1.5, respectively. The values of the seismic coefficients, Ca and Cv, may be taken 0.54 and 0.95, respectively. A table providing the recommended seismic coefficients for the project site is included in the Foundations Recommendations section of this report.

6.6 **Seismic Ground Motion**: Seismic ground motion estimates were developed to conduct the liquefaction hazard analyses. The "Design Basis Ground Motion," Section 1627 of the California Building Code (CBC), is defined as the seismic ground motion having a 10 percent probability of being exceeded in a 50-year period. The probabilistic analyses described in this section was used to determine the Design Basis Ground Motion.

Probabilistic ground motion evaluation requires use of a seismicity model and ground motion attenuation functions to approximate the modification of seismic waves between the earthquake hypocenter (source) and the site. The seismicity model, including the location and fault parameters (such as slip rate, fault length, magnitude and rupture area) of faults capable of impacting the site, were based on published geologic papers and correspond with those listed in the California Geological Survey (CGS) database entitled "California Fault Parameters." Multiple probabilistic evaluations were conducted using the FRISKSP computer program and the faults indicated as those active and potentially active faults listed in the "California Fault Parameters" database.

Our evaluation considered the average of the predicted design basis ground motions for four (4) separate analyses incorporating the ground motion attenuation relationships of Boore et. al. (1997), Sagigh et. al. (1997), Idriss (1994), and Abrahamson and Silva (1997), the active and potentially active faults within 100 kilometers of the site. The average of design basis site accelerations based on the above attenuation relationships was determined to be 0.42g. Accordingly, a ground motion of 0.42g was selected for use in the liquefaction analyses. This represents a value not weighted for magnitude. Magnitude weighting was conducted in the liquefaction analysis.

Hazard deaggregation was conducted using the FRISKSP computer program. The results indicate that an earthquake magnitude of 6.9 represents the predominant earthquake magnitude contributing to the Design Basis Ground Motion (L. A. Basin Segment of Newport - Inglewood Fault). This earthquake magnitude was used with the above ground motion estimate for the liquefaction analyses.

6.7 **Liquefaction and Seismic Settlement:** The subject site is located in a seismic hazard special studies zone for liquefaction which delineate areas of historical occurrence of liquefaction or where local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacement such that a mitigation as defined in Public Resources Code Section 2693© would be required. A site specific liquefaction evaluation was performed as a part of this report.

Liquefaction and seismic settlement are conditions that can occur under seismic shaking from earthquake events. Liquefaction describes a phenomenon in which a saturated, cohesionless soil loses strength during an earthquake as a result of induced shearing strains. Lateral and vertical movements of the soil mass, combined with loss of bearing usually results. Fine, well sorted, loose sand, shallow groundwater conditions, higher intensity earthquakes, and particularly long duration of ground shaking are the common characteristics for liquefaction.

Liquefaction and seismic settlement analyses were conducted based on soil properties revealed by test borings and CPT soundings, and the results of laboratory testing. The analyses were conducted for soils encountered in CPT soundings CPT-1 through CPT-6 using a spread sheet developed based on the computer program LIQUEFY2 developed by Mr. Thomas F. Blake. A design basis earthquake acceleration of 0.42g and a design earthquake magnitude of 6.9 were used. The N-values generated based on the CPT results were used to determine the cyclic stress ratio needed to initiate liquefaction. Soil parameters, such as wet unit weight, N-value, fines content, and depth of N-value tests, were input for the soil layers encountered throughout the depths explored (see test boring logs, Appendix B). An historic high groundwater depth of 4 feet below existing grade was used in the analyses.

One of the most common phenomena that occurs during seismic shaking is the induced settlement of loose, unconsolidated sediments. This can occur in unsaturated and saturated granular soils, however, seismic settlements are typically largest where liquefaction occurs (saturated soils).

The results of liquefaction analyses indicate liquefaction would occur in medium dense silty sands and poorly graded sands and stiff sandy silts. Liquefaction was predicted to occur as a result of the design basis earthquake ground motion in discrete sandy layers between the depths of 4 and 50 feet below the present ground surface. Estimates of total seismic settlements ranged from about 1.3 to 4.0 inches. The highest differential seismic settlement calculated between the CPT soundings was about 1 inch in 50 feet. In addition, static total and differential settlements on the order of 1 inch and ½ inch, respectively, are anticipated for the proposed building (assumes site preparation recommended in this report is properly performed). Therefore, combined calculated settlements (static and seismic) of up to 5 inches total and 2 inches differential should be anticipated for design if liquefaction is not mitigated. It should be noted that these estimates do not include settlements resulting from an additional effect of liquefaction, loss of bearing strength. The predicted settlements exceed the Home Depot Design Manual requirements of 1 inch total and ½ inch in 50 feet differential.

In addition, some loss of soil bearing capacity could occur as a result of liquefaction of soils between about 4 and 15 feet BSG. Loss of soil bearing capacity within the foundation influence zone (up to about 15 feet BSG) would be anticipated to result in significantly higher settlements than predicted above. Estimates of total and differential seismic settlements resulting from loss of bearing strength can vary widely, however, differential settlements would be anticipated to be much higher than the 2 inches predicted based on no loss of bearing strength.

6.8 <u>Mitigation of Static and Seismic Settlements</u>: Given the magnitude of the anticipated static and seismic settlements, the proposed structure should be designed to tolerate the combined total and differential settlements presented in this report, either by structural mitigation or ground modification. The Home Depot criteria manual requires that the primary option for mitigation of excessive seismic settlements be ground modification methods. It should be noted that seismic settlement, including settlements resulting from loss of bearing strength could be addressed by means of ground modification and/or structural mitigation.

Typical options for structural mitigation include deep foundation systems, mat foundations, quasi-rigid foundations, etc. Structural mitigation should consider that liquefaction occurring in sandy layers at depths of about 4 to 15 feet could cause loss of bearing strength. Settlements due to loss of foundation bearing capacity should be considered for design. In the event that structural mitigation is not selected, ground modification will be required.

Typical options for ground modification include "Stone" columns, compaction grouting, etc. Options for ground modification such as stone columns are limited considering that the proposed structure is located adjacent to an existing residential development and other businesses. Due to the proximity of the existing adjacent structures, a compaction grouting program may be better suited for this site, since the ground vibrations and noise associated with this type of work is significantly less than construction of stone column type mitigation. Grout injection into loose or soft soils has also been used to reduce potential settlements. Considering the relatively thin and deep nature of the potentially liquefiable soils, injection type grouting methods are preliminarily estimated to be a potentially feasible alternative for reducing seismic settlements.

6.9 <u>Asphaltic Concrete (AC) Pavements</u>: The existing asphaltic concrete pavements appeared to be in poor condition. Numerous areas of "alligator" cracking and potholes were observed throughout the parking and drive areas. It should be noted that these pavements are at least 15 years old; thus, theoretically, about 70 to 80 percent of the design life of the pavements have been expended.

Preliminary recommendations for asphaltic concrete pavement structural sections are presented in the "Recommendations" section of this report. The thicknesses of the Asphalt Concrete and the underlying aggregate base materials are based upon the amount and type of traffic loads being considered and the Resistance or R-value of the subgrade soils which will support the pavement. The measure of the amount and type of traffic loads are based upon an index of equivalent axle loads (EAL) from loading of heavy trucks called a traffic index (T.I).

Recommendations for new asphaltic concrete pavement structural sections and overlays are presented in the "Recommendations" section of this report. The structural sections were designed using the gravel equivalent method in accordance with Chapter 600 of the California Department of Transportation Highways Design Manual (fifth edition). The traffic loading data were obtained from the Design Criteria Manual provided by Home Depot U.S.A., Inc. For the proposed Home

Depot store, the "standard duty" pavement should be designed for a life of 10 years and an EAL (18 kips) of 50,000 axles. An EAL of 50,000 equates to a traffic index of 6.5. The "heavy duty" pavement was designed for a life of 10 years and an EAL (18 kips) of 220,000 axles. This equates to a traffic index of 7.5. If traffic loading is anticipated to be greater than assumed, the pavement sections should be re-evaluated.

In evaluation of the pavement design for this project, samples of the onsite soils anticipated to be representative of the soils which will support pavements were obtained and R-value testing was performed in accordance with ASTM D2844. The R-value test results are summarized in Appendix C of this report.

The existing pavement sections do not comply with the minimum Home Depot criteria based on traffic index values of 6.5 and 7.5, and a design R-value of 20. As a comparison, the design section for standard duty pavements based on the minimum Home Depot criteria would be 3.5 inches of AC over 11.5 inches of AB. The design section for heavy duty pavements based on the minimum Home Depot criteria would be 4.0 inches of AC over 13.5 inches of AB. The average existing pavement section consists of 2¼ inches of AC over 3½ inches of AB.

In our opinion, the pavements would have to be removed and replaced to comply with the Home Depot Design Criteria. Considering the range of pavement section thicknesses measured, it is estimated that an AC overlay of about 5¼ inches would be required to achieve the "standard duty" T. I. of 6.5 and an AC overlay of 7¼ inches would be required to achieve a "heavy duty" T. I. of 7.5. In our opinion, overlays of these thicknesses are not practical or cost-effective.

6.10 **<u>Portland Cement Concrete (PCC) Pavements</u>:** Recommendations for Portland Cement Concrete pavement structural sections are presented in the "Recommendations" section of this report. The PCC pavement sections are based upon the amount and type of traffic loads being considered and the Resistance or R-value of the subgrade soils which will support the pavement. The measure of the amount and type of traffic loads are based upon an index of equivalent axle loads (EAL) from the loading of heavy trucks called a traffic index (T.I).

In evaluation of the pavement design for this project, samples of the onsite soils anticipated to be representative of the soils which will support pavements were obtained and R-value testing performed in accordance with ASTM D2844. The R-value test results are summarized in Appendix C of this report.

The EALs for each of the pavement sections were converted to the number of 5-axle trucks per day, one direction, anticipated for the proposed store. The EAL for the "standard duty" pavement section of 50,000 was converted to 14 axles or 6 five-axle trucks per day. The EAL for the "heavy duty" pavement section is 220,000 or 26 five-axle trucks per day. The recommended structural sections were based primarily on the Portland Cement Association "Thickness Design of Highway and Street Pavements."

The PCC pavement sections were designed for a life of 10 years, a load safety factor of 1.1, a single axle weight of 12,000 pounds, a tandem axle weight of 36,000 pounds. A modulus of subgrade reaction, K-value, for the pavement section, considering a minimum 6-inch layer of aggregate base material (minimum R-value of 70), of 200 psi/in at the top of the aggregate base was used for pavement design.

6.11 **Corrosion Protection:** The risk of corrosion of construction materials relates to the potential for soil-induced chemical reaction. Corrosion is a naturally occurring process whereby the surface of a metallic structure is oxidized or reduced to a corrosion product such as iron oxide (i.e., rust). The metallic surface is attacked through the migration of ions and loses its original strength by the thinning of the member. Corrosion can eventually damage or destroy a metallic object.

Soils make up a complex environment for potential metallic corrosion. The corrosion potential of a soil depends on soil resistivity, texture, acidity, field moisture and chemical concentrations. In order to evaluate the potential for corrosion of metallic objects in contact with the onsite soils, chemical testing of soil samples was performed by Twining as part of this report. The test results are included in Appendix C of this report. Conclusions regarding the corrosion potential of the soil tested are included in the Conclusions section of this report.

If piping or concrete are placed in contact with imported soils, these soils should be analyzed to evaluate the corrosion potential of these soils.

If the manufacturers or suppliers cannot determine if materials are compatible with the soil corrosion conditions, a professional consultant, i.e., a corrosion engineer, with experience in corrosion protection should be consulted to provide design parameters. Twining does not provide corrosion engineering services.

6.12 **Sulfate Attack of Concrete:** Degradation of concrete in contact with soils due to sulfate attack involves complex physical and chemical processes. When sulfate attack occurs, these processes can reduce the durability of concrete by altering the chemical and microstructural nature of the cement paste. Sulfate attack is dependent on a variety of conditions including concrete quality, exposure to sulfates in soil/groundwater and environmental factors. The standard practice for geotechnical engineers in evaluation of the soils anticipated to be in contact with concrete is to perform testing to determine the sulfates present in the soils. The test results are then compared with the categories of the 2001 Uniform Building Code, Table 19-A-3 to provide guidelines for concrete exposed to sulfate-containing solutions. Common methods used to resist the potential for degradation of concrete due to sulfate attack from soils include, but are not limited to the use of sulfate-resisting cements, air-entrainment and reduced water to cement ratios.

7.0 CONCLUSIONS

Based on the data collected during the field and laboratory investigations, our geotechnical experience in the vicinity of the project site, and our understanding of the anticipated construction, we present the following general conclusions.

7.1 The site is suitable for the proposed construction with regard to support of foundations and concrete slabs-on-grade, provided the recommendations contained in this report are followed. However, it should be noted that the estimated total (static and seismic) settlements exceed Home Depot's criteria, and mitigation, such as injection grouting, stone columns, etc. would be required to reduce the predicted settlements.

7.2 The site is located approximately ½ mile east from the "Methane District Two." The extent of methane districts is defined in the City of Huntington Beach Building Code. Additional research should be conducted by the project architect in order to determine the need for additional studies or building requirements relative to the Methane District and this site in particular.

7.3 The existing AC parking and drive area pavement sections were observed to be generally in poor condition. The pavement sections do not comply with the Home Depot standard design and minimum criteria. The design section for standard duty pavements, based on the minimum Home Depot criteria, would be 3.5 inches of AC over 11.5 inches of AB. The design section for heavy duty pavements, based on the minimum Home Depot criteria, would be 4.0 inches of AC over 13.5 inches of AB. Considering the range of pavement section thicknesses measured, and using the original design sections, it is estimated that an AC overlay of about 5¼ inches would be required to achieve the "standard duty" T. I. of 6.5 and an AC overlay of 7¼ inches would be required to achieve a "heavy duty" T. I. of 7.5. Considering the wide variation in existing pavement sections measured, the potential for variable performance across new overlays, and the required construction of the new curb and gutters (due to the high thicknesses of overlay), it is our opinion that the remove-and-replace alternative would provide a significantly better pavement than any other alternative.

7.4 Soils encountered consisted of interbedded layers with very loose to medium dense silty sands, loose to medium dense poorly graded sands, soft to very stiff sandy silts, and soft to very stiff lean clays to the maximum depth explored, 50 feet BSG. The near surface soils predominantly consisted of silty sands and sandy silts.

7.5 The near the surface silty and poorly graded sands exhibited high compressibility characteristics, moderate collapse potential, and low shear strength. The near the surface sandy silt soils exhibited low compressibility and low collapse potential.

7.6 Consideration of foundation embedment for frost depth is not required since the mean monthly temperature of the Huntington Beach area is above freezing.

7.7 Upon completion of the deep ground improvement activity (if performed), shallow spread footings placed entirely on at least 2 feet of engineered fill can provide adequate support for the proposed structure with regard to static settlements.

7.8 The soils at the bottom of the over-excavation should be scarified to a minimum depth of 12 inches, conditioned (wetted or aerated), and compacted as engineered fill. The contractor should note that the bottom of excavations will likely exhibit instability due to high moisture contents and require stabilization such as chemical treatment, etc. As a minimum, the contractor shall stabilize the upper 16 inches of the exposed soils at the bottom of excavations using chemical treatment with a minimum of 5 percent high calcium quicklime or Portland cement. The type of chemical treatment, high calcium quicklime or Portland cement, will be determined by the Twining at the time of construction.

7.9 The results of liquefaction analyses indicate liquefaction would occur in medium dense silty sands and poorly graded sands and stiff sandy silts. Liquefaction was predicted to occur as a result of the design basis earthquake ground motion in discrete sandy layers between the depths of 4 and 50 feet below the present ground surface. Estimates of total seismic settlements ranged from about 1.3 to 4.0 inches. The highest differential seismic settlement calculated between the CPT soundings was about 1 inch in 50 feet. In addition, static total and differential settlements on the order of 1 inch and ½ inch, respectively, are anticipated for the proposed building (assumes site preparation recommended in this report is properly performed). Therefore, combined calculated settlements (static and seismic) of up to 5 inches total and 2 inches differential should be anticipated for design if liquefaction is not mitigated. It should be noted that these estimates do not include settlements resulting from an additional effect of liquefaction, loss of bearing strength. The predicted settlements exceed the Home Depot Design Manual requirements of 1 inch total and ½ inch in 50 feet differential.

7.10 Given the magnitude of the anticipated static and seismic settlements, the proposed structure should be designed to tolerate the combined total and differential settlements (static and seismic) presented in this report. Either structural mitigation or ground modification, or a combination of the two, should be used for the project. As noted previously, Home Depot's criteria requires ground modification as the primary option to address excessive seismic settlements.

7.11 To achieve total and differential static settlements of 1 inch and ½ inch in 50 feet, over-excavation and compaction will be required to provide a minimum of 2 feet of engineered fill below all foundations.

7.12 Floor slabs may be supported on at least 6 inches of Class 2 aggregate base course material, over at least 18 inches of moisture conditioned (wetted or aerated), imported non-expansive granular engineered fill.

7.13 The analytical results of a soil sample analysis indicate that the near-surface soils exhibit a "corrosive" corrosion potential to buried metal objects.

7.14 The analytical results of a soil sample analysis indicate a "negligible" potential for sulfate attack on reinforced concrete placed in the near-surface soils (CBC Table 19-A-3).

7.15 The near-surface soils exhibit fair to good support characteristics for pavements.

7.16 The existing Taco Bell restaurant and the Blockbuster retail store are to remain unimproved as a part of the Home Depot development. The project contractor will be responsible for protection of these and other structures and improvements which are not to be removed or impacted during the construction process. Prior to the start of construction, the contractor shall be responsible for surveying the existing structures and improvements to document the condition of these facilities prior to the start of construction.

7.17 Groundwater was encountered at depths ranging from about 9 feet to 18 feet BSG in the borings drilled at the subject site and at a depth of 5 feet in test boring B-24. Based on our observations of the groundwater depths across the site, the groundwater encountered at a depth of 5 feet is estimated to be a zone of perched groundwater. Therefore, zones of perched water should be anticipated at this site which may require localized dewatering. Contractors should consider that areas with groundwater as shallow as about 4 feet BSG could be encountered. A design groundwater depth of 4 feet was used based on historic high groundwater data.

8.0 RECOMMENDATIONS

Based on the evaluation of the field and laboratory data and our geotechnical experience in the vicinity of the project, we present the following recommendations for use in the project design and construction. However, this report should be considered in its entirety. When applying the recommendations for design, the background information, procedures used, findings, evaluation, and conclusions should be considered. The recommended design consultation and construction monitoring by Twining are integral to the proper application of the recommendations.

8.1 General

8.1.1 Grading and structural plans were not available at the time this report was prepared. It is our understanding that the proposed finished pad grade would not change from the existing site grade by more than about 3 feet. If the finished grades are higher or lower than assumed, the recommendations presented may not be appropriate for the changed conditions. Twining should be provided the opportunity to review the grading plans and foundation plans before the plans are released for bidding purposes so that any relevant recommendations can be presented.

8.1.2 Prior to final design and bidding, the deep ground improvement program should be defined and the deep ground improvement plans and specifications should be prepared. Twining is currently evaluating deep ground improvement alternatives for this site. Alternatively, the project structural engineer should be consulted regarding the possible structural mitigation alternative. The owner and project consultants will be consulted with regard to our findings prior to selecting a final mitigation alternative for this site (i.e., structural mitigation or ground improvement).

8.1.3 A demolition plan should be developed to identify existing improvements which will require removal. As a minimum, this plan should show the structural elements planned for removal. The structural elements shown on the demolition plan should be removed in their entirety and the resulting excavations backfilled with non-expansive engineered fill under the observation of Twining.

8.1.4 Foundation plans for the proposed Home Depot were not provided for review at the time of preparing this report. When completed, our firm should be provided the opportunity to review the final grading plans and foundation details, and provide amended recommendations as necessary.

8.1.5 A preconstruction meeting including, as a minimum, the owner, general contractor, foundation and paving subcontractors, and Twining should be scheduled by the general contractor at least one week prior to the start of clearing and grubbing. The purpose of the meeting should be to discuss critical project issues, concerns and scheduling.

8.1.6 Contractors should be aware that areas proposed for pavements and slabs-on-grade adjacent to the proposed building and/or within the overbuild zone should incorporate the more stringent requirements for over-excavation, aggregate base, non-expansive soils and native soil moisture conditioning as recommended in this report for interior slabs-on-grade, AC pavements, and PCC pavements.

8.1.7 The contractor is responsible for compliance with the SWPPP requirements specified in the project plans, the project specifications, and the City of Huntington Beach, whichever is most stringent.

8.1.8 Groundwater was encountered at depths ranging from about 9 feet to 18 feet BSG in the borings drilled at the subject site and at a depth of 5 feet in test boring B-24. Based on our observations of the groundwater depths across the site, the groundwater encountered at a depth of 5 feet is anticipated to be a zone of perched groundwater. Therefore, zones of perched water should be anticipated at this site which may require localized dewatering.

8.1.9 The contractor is responsible for including in the base bid the costs to perform the work required by the Geotechnical Report, the project plans, the project specifications and the City of Huntington Beach, whichever is most stringent. After review of the aforementioned documents, the contractor(s) bidding on this project should determine if the data are sufficient for accurate bid purposes. If the data are not sufficient, the contractor should conduct, or retain a qualified geotechnical engineer to conduct supplemental studies and collect more data as required to prepare accurate bids.

8.1.10 The contractor is responsible for protecting existing facilities from damage including but not limited to adjacent fences, buildings, utilities, streets, etc. Any damage shall be repaired by the contractor at no cost to Home Depot.

8.1.11 The contractor should use appropriate grading equipment such as low-pressure equipment, steel tracks, etc. to achieve the required over-excavation, compaction and subgrade stabilization to minimize rutting and subgrade instability.

8.1.12 Prior to placement of asphaltic concrete adjacent to slabs-on-grade, curbs, gutters, the contractor shall compact the area immediately adjacent to these features with equipment that can provide adequate compactive effort to the aggregate base adjacent to the vertical face of the concrete to achieve a dense, non-yielding condition. These compaction operations should be observed by Twining.

8.1.13 Contractors should also be aware that wet soils are anticipated near and below the proposed pad grades and will likely be significantly above the optimum moisture content required for proper compaction and could require soil drying or chemical treatment for stabilization to achieve the required relative compaction. No change orders will be allowed for wet weather conditions, wet soil, soil instability, etc. including chemical treatment, geotextile fabric, rock, soil import, etc.

8.1.14 Based on the high moisture contents (up to 20 percent above optimum moisture content) determined for the soils within the depths anticipated depths for excavations, the contractor should anticipate unstable soil conditions will be encountered during excavations and installation of slabs-on-grade, foundations, utilities, etc. Therefore, the soils will require stabilization. The Contractor should note that the base bid should include stabilization of the bottom 16 inches of the over-excavation with 5 percent high calcium quicklime. The Contractor is responsible for all permits related to this activity including the requirements related to Storm Water Pollution Protection Plan (SWPPP).

8.2 <u>Site Grading and Drainage</u>

8.2.1 It is critical to develop and maintain site grades which will drain surface and roof runoff away from foundations and floor slabs - both during and after construction. Adjacent exterior finished grades should be sloped a minimum of two percent for a distance of at least five feet away from the structures to preclude ponding of water adjacent to foundations. Adjacent exterior grades which are paved should be sloped at least 1 percent away from the foundations.

8.2.2 Landscaping after construction should direct rainfall and irrigation runoff away from the structure and not promote ponding of water adjacent to the structures. Care should be taken to maintain a leak-free sprinkler system.

8.4.6 Open graded gravels used as engineered fill and/or backfill should be completely encapsulated in an approved geotextile fabric (Mirafi 140N or equivalent), and vibrated and mechanically compacted to a dense, non-yielding condition under the observation of Twining.

8.4.7 Aggregate base shall comply with Class 2 aggregate base per State of California Standard Specifications. Aggregate base shall be compacted to a minimum relative compaction of 95 percent. The contractor shall test the aggregate base for sulfate content and provide the results to the Owner, Architect and Twining prior to delivery of the aggregate base to the site. The aggregate base shall not be recycled material.

8.5 Foundations

8.5.1 Over-excavation for foundations, soil stabilization, shoring, etc. should be conducted as indicated in this report (including subsection 8.3) and the appendices of this report. Foundations should be supported on a minimum of 24 inches of engineered fill.

8.5.2 Structural loads may be supported on spread or continuous footings placed entirely on at least 2 feet of engineered fill, engineered fill that extends to at least one foot below bottom of existing improvements that are removed, and engineered fill that extends to at least 4 feet below preconstruction site grades, whichever is deeper. The over-excavation depth shall be uniform below the entire building pad including the required overbuild zone. Spread and continuous footings may be designed for a maximum net allowable soil bearing pressure of 2,000 pounds per square foot for dead-plus-live loads. These values may be increased by one-third for short duration wind or seismic loads.

8.5.3 New foundations should extend to a minimum depth of 24 inches below lowest adjacent finished grade. Footings should have a minimum width of 15 inches, regardless of load.

8.5.4 The results of liquefaction analyses indicate liquefaction would occur in medium dense silty sands and poorly graded sands and stiff sandy silts. Liquefaction was predicted to occur as a result of the design basis earthquake ground motion in thin layers between the depths of about 4 and 50 feet below the present ground surface. Estimates of total and differential seismic settlements of as high as 4 inches and 1 inch in 50 feet, respectively, were predicted. A vertical movement (swell) of ½ inch should also be anticipated. In addition, static total and differential settlements on the order of 1 inch and

½ inch, respectively, are anticipated for the proposed building. Therefore, combined settlements (static and seismic) of up to 5 inches total and 2 inches differential should be anticipated for design if liquefaction is not mitigated. These settlements exceed the Home Depot Design Manual requirements of 1 inch total and ½ inch in 50 feet differential.

8.5.5 Given the magnitude of the anticipated combined static and seismic settlements, the proposed structure should either be designed to tolerate the combined total and differential settlements presented in this report or the potential settlements should be reduced using ground modification methods. These alternatives should be evaluated by the design team and the preferred approach selected based on feasibility, cost, schedule and reliability. The final report will incorporate the recommendations for the selected approach.

8.5.6 The foundations should be continuous around the perimeter of the structure to reduce moisture migration beneath the structure. Continuous perimeter foundations should be extended through doorways and/or openings that are not needed for support of loads.

8.5.7 The following factors were developed based on the tables in Chapter 16 of the 2001 CBC and the digitized active fault locations published by CGS.

Seismic Factor	CBC Value
Seismic Zone	Z = 4
Soil Type	S_D
Source Types	B
Near Source Acceleration Factor, Na	1.2
Near Source Velocity Factor, Nv	1.5
Seismic Acceleration Coefficient, Ca	0.54
Seismic Velocity Coefficient, Cv	0.95

8.5.8 The pylon sign may be supported on a drilled-cast-in-hole reinforced concrete foundation (pier). An allowable skin friction of 150 pounds per square foot per foot of embedment may be used to resist axial loads. Lateral load resistance may be estimated using the CBC non-constrained design (Section 1806.8.2.1). A value of 150 pounds per square foot per foot of depth may be used.

8.5.9 At the time of pier construction and until the concrete is placed, the shaft excavation should have stable sidewalls and all sloughed soil should be completely removed from the bottom of the excavation. If the drilled hole exhibits instability, it should be cased. Twining should observe the excavation to confirm that the pier was constructed as described above, and the soils encountered are similar to those indicated in this report.

8.5.10 Twining should observe the bottom of foundation excavations and the exposed subgrade for the slabs-on-grade prior to the placement of reinforcing steel and utilities. The contractor shall provide a minimum of 48 hours notice for these observations.

8.6 Frictional Coefficient and Earth Pressures

8.6.1 The bottom surface area of concrete footings or concrete slabs in direct contact with engineered fill can be used to resist lateral loads (areas of slabs underlain by a synthetic moisture barrier cannot be considered). An ultimate coefficient of friction of 0.38, reduced by an appropriate factor of safety, can be used for design. In areas where slabs are underlain by a synthetic moisture barrier, an ultimate coefficient of friction of 0.15, reduced by an appropriate factor of safety, can be used for design.

8.6.2 The ultimate passive resistance of the native soils and engineered fill may be assumed to be equal to the pressure developed by a fluid with a density of 270 pounds per cubic foot. An appropriate factor of safety should be applied.

8.6.3 The passive pressure was calculated based on a minimum soil unit weight of 90 pounds per cubic foot. The soils within the passive zone at the foot of retaining walls (one footing width in front of the wall to a depth equal to the footing depth) should be tested to verify that the soils have the minimum unit weight of 90 pounds per cubic foot (with moisture). If the soils have a unit weight of less than 90 pounds per cubic foot, the soils within this zone should be over-excavated and replaced as engineered fill. These soils should be tested prior to backfilling behind the wall.

8.6.4 A minimum factor of safety of 1.5 should be used when combining the frictional and passive resistance of the soil to determine the total lateral resistance. The upper 12 inches of subgrade should be neglected in determining the total passive resistance.

8.6.5 The active and at-rest pressures of the native soils and engineered fill may be assumed to be equal to the pressures developed by a fluid with a density of 43 and 65 pounds per cubic foot, respectively. These pressures assume level ground surface and do not include the surcharge effects of construction equipment, loads imposed by nearby foundations and roadways and hydrostatic water pressure.

8.6.6 The active and at-rest pressures were calculated based on a maximum soil unit weight of 130 pounds per cubic foot. The compacted soils behind the retaining walls should not have a compacted unit weight above 130 pounds per cubic foot (with moisture). If the soils have a unit weight of greater than 130 pounds per cubic foot, the soils should be over-excavated and replaced at a lower degree of compaction. If the backfill soils must be placed at a unit weight of over 130 pounds per cubic foot to achieve minimum compaction requirements the material should not be used as backfill behind retaining walls.

8.6.7 The at-rest pressure should be used in determining lateral earth pressures against walls which are not free to deflect. For walls which are free to deflect at least one percent of the wall height at the top, the active earth pressure may be used.

8.6.8 The above earth pressures assume that the backfill soils will be drained. Therefore, all retaining walls should incorporate the use of a drain, either a filter fabric encased gravel section or a geo-composite drain, to prevent hydrostatic pressures from acting on the walls. Drainage should be directed either into weep-holes or perforated pipe which can carry drainage from behind the walls.

8.6.9 Since the pressures recommended in this section do not include vehicle surcharges, it is recommended to use lighter hand operated or walk behind compaction equipment to avoid wall damage during construction. Heavier compaction equipment could cause loads in excess of design loads which could result in cracking, excessive rotation, or failure of a retaining structure.

8.6.10 Where stand alone retaining structures provide more than 6 feet of support, or for structures where the exterior grades on opposite sides differ by more than 6 feet, seismic factors or increments need to be included in the retaining system design. The wall designer should determine if seismic increments should be used or not. If seismic increments are required, contact Twining for recommendations for seismic geotechnical design considerations for the retaining structures.

8.7 Retaining Walls

8.7.1 The moisture content of the in-situ soils which will be encountered during grading operations (cuts and fills) could be above optimum moisture content, and portions of the soils will likely be above optimum moisture content and be unstable. The contractor is responsible for placing and compacting the upper 8 inches of the exposed subgrade in areas to receive fills, and the placement and compaction of engineered fill to achieve the requirements of this report, the project plans, the project specifications, and the City of Huntington Beach, whichever is most stringent. The contractor is responsible for processing (wetting, drying, chemical treatment, etc.) the soils to achieve these requirements. No change orders will be allowed for weather conditions, or the necessary processing of in-situ or other soils to achieve the minimum relative compaction requirements for the project. If chemical treatment is used by the contractor, the contractor will be responsible for compliance with the project Storm Water Pollution Plan (SWPPP) requirements associated with the use of these materials, i.e., pH of runoff, etc.

8.7.2 Structural loads for retaining walls may be supported on spread or continuous footings placed entirely on at least 2 feet of engineered fill. Shallow spread wall footings may be designed for a maximum net allowable soil bearing pressure of 2,000 pounds per square foot for dead-plus-live loads. This value may be increased by one-third for short duration wind or seismic loads.

8.7.3 Retaining walls should be constructed with non-expansive granular free-draining backfill placed within the zone extending from a distance of 1 foot laterally from the bottom of the wall footing at a 1 horizontal to 1 vertical gradient to the surface. This requirement should be detailed on the construction drawings. Granular backfill will reduce the effects of expansive soil pressures on the wall. Granular wall backfill should meet the following requirements:

Percent Passing 3-Inch Sieve	100
Percent Passing No. 4 Sieve	50 - 100
Percent Passing No. 200 Sieve	10 - 45
Plasticity Index	Less than 10
Expansion Index (CBC 29-2)	Less than 10

8.7.4 The import fill material should be tested and approved as indicated under subsection 8.4 of this report.

8.7.5 Granular wall backfill should be compacted to 95 percent of the maximum dry density as determined by ASTM Test Method D1557.

8.7.6 Retaining walls may be subject to lateral loading from pressures exerted from the soils, groundwater, slabs-on-grade, and pavement traffic loads, adjacent to the walls. In addition to earth pressures, lateral loads due to slabs-on-grade, footings, or traffic above the base of the walls should be included in design of the walls.

8.7.7 Retaining walls should be designed with a drain system including permeable backfill and drain pipes near the wall to adequately reduce the potential for hydrostatic pressures behind the wall. Drainage should be directed to pipes which gravity drain to closed pipes of the storm drain or subdrain system. Drain pipe outlet invert elevations should be sufficient (a bypass should be constructed if necessary) to preclude hydrostatic surcharge to the wall in the event the storm drain system did not function properly. Clean out and inspection points should be incorporated into the drain system and be spaced every 100 lineal feet along the wall. Drainage should be directed to the site storm drain system.

8.7.8 If open graded materials such as crushed rock are used as drain material, these materials should be fully encased in filter fabric and compacted to a non-yielding condition under the observation of the geotechnical engineer. A Caltrans Class 2 permeable material, installed without the use of filter fabric, is preferable to open graded material as it presents a lower potential for clogging than the filter fabric. Class 2 permeable material should be compacted to 95 percent relative compaction (CAL Test 216) using a vibratory plate.

8.7.9 It is recommended to use lighter hand operated or walk behind compaction equipment in the zone equal to one wall height behind the wall to reduce the potential for damage to the wall during construction. Heavier compaction equipment could cause loads in excess of design loads which could result in cracking, excessive rotation, or failure of a retaining structure. The contractor is responsible for damage to the wall caused by improper compaction methods behind the wall.

8.7.10 If retaining walls are to be finished with dry wall, plaster, decorative stone, etc., waterproofing measures such as manufactured drainage boards (i.e., Miradrain 6000 or 6200 or approved alternative) should be applied to moisture proof the exterior of the walls. Waterproofing should also be used if effervescence (discoloration of wall face) is not acceptable.

8.8 Interior Slabs-on-Grade

The slabs on the project that should be prepared as interior slabs include: the floor slab of the Home Depot store, the front sidewalk, the Garden Center slab, sidewalks adjacent to the building, the entrance canopy slab, the lumber off-loading slab, the truck dock slab, customer pick-up porte-cochere, and the pickup lane slab.

8.8.1 The recommendations provided herein are intended only for the design of interior concrete slabs-on-grade and their proposed uses, which do not include construction traffic (i.e., cranes, concrete trucks, and rock trucks, etc.). The building contractor should assess the slab section and determine its adequacy to support any proposed construction traffic.

8.8.2 A structural engineer experienced in slab-on-grade design should recommend the thickness, design details and concrete specifications for the proposed slabs-on-grade for a combined differential vertical movement (static and seismic differential settlements) of the floor slabs of 2 inches differential over a horizontal distance of 50 feet. This is based on design of a quasi-rigid slab system intended to structurally mitigate the liquefaction and seismic settlements. Alternatively, a deep ground improvement may be considered to reduce the design differential settlements.

8.8.3 Interior concrete slabs-on-grade should be supported on a minimum of 6 inches of Class 2 aggregate base over at least 18 inches of imported non-expansive engineered fill. The minimum 6 inches of AB is recommended directly below the slabs-on-grade to improve the slab support characteristics and for construction purposes. Aggregate base and all fill should be compacted to a minimum relative compaction of 95 percent.

8.8.4 The moisture content of the subgrade or engineered fill below the non-expansive section should be verified to be within optimum and three (3) percent above optimum moisture content prior to placing non-expansive fill, and also within 48 hours of placement of the vapor retarding membrane or the concrete for the slab-on-grade if a vapor retarding membrane is not used. The moisture content of the subgrade beneath the non-expansive section to a depth of at least 12 inches should be tested and confirmed prior to placement of the non-expansive fill section, vapor retarding membrane or slab-on-grade. If necessary to achieve the recommended moisture content, the clayey subgrade could be over-excavated, conditioned (i.e., aerated, treated, moisture-conditioned, etc.) as necessary and compacted as engineered fill.

8.8.5 In the event that the earthwork operations for this project are conducted prior to the construction of the individual structures such that the construction sequence is not continuous, (or if construction operations disturb the surface soils) we recommend that the exposed subgrade to receive floor slabs be tested to verify adequate moisture content and compaction. If the moisture content just prior to placement of the floor slab is not within optimum and three (3) percent above optimum moisture content, the soils should be conditioned as necessary. If adequate compaction is not verified, the disturbed subgrade should be over-excavated, scarified, and compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM Test Method D1557. This condition should be verified prior to installation of plumbing, footing excavation, and construction of the slabs-on-grade.

8.8.6 An vapor retarding membrane such as Stegowrap 15; Vapor Block 15 (Raven Industries, P.O. Box 5107, Sioux Falls, SD 57117-5107, Phone: 1-800-635-3456), or equivalent, should be placed below the aggregate base section beneath all interior floor slabs where floor coverings, such as carpet and tile, are anticipated or where moisture could permeate into the interior and create problems. Typically, Home Depot does not use a vapor barrier; however, due to the noted moisture problems in the existing Kmart and the high groundwater table, a vapor barrier may be required for this project to reduce the potential for excessive moisture migration and related damage to product, etc. The underslab membrane should have a high puncture resistance, high abrasion resistance, rot resistant, and mildew resistant. We recommend the membrane be selected in accordance with ASTM C755-85, Standard Practice For Selection of Vapor Retarder For Thermal Insulation and conform to ASTM E154-99 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Waters, or as Ground Cover. It is recommended that the vapor retarding membrane selection and installation conform to the ACI Manual of Concrete Practice, Guide for Concrete Floor and Slab Construction (302.1R-96), Addendum, Vapor Retarder Location and ASTM E 1643 - 98, Standard Practice for Installation of Water Vapor Retarders Used In Contact with Earth or Granular Fill Under Concrete Slabs. In addition, it is recommended that the manufacturer of the floor covering and floor covering adhesive be consulted to determine if these manufacturers have additional recommendations regarding the design and construction of the slab-on-grade, testing of the slab-on-grade, slab preparation, application of the adhesive, installation of the floor covering and maintenance requirements.

8.8.7 The membrane should be installed so that there are no holes or uncovered areas. All seams should be overlapped and sealed with the manufacturer approved tape continuous at the laps so they are vapor tight. All perimeter edges of the membrane, such as pipe penetrations, interior and exterior footings, joints, etc.) should be caulked per manufacturer's recommendations.

8.8.8 Tears or punctures that may occur in the membrane should be repaired prior to placement of concrete per manufacturer's recommendations. Once repaired, the membrane should be inspected by the contractor and the owner to verify adequate compliance with manufacture's recommendations.

8.8.9 The vapor retarding membrane is not required beneath exposed concrete floors, such as warehouses and garages, provided that moisture intrusions into the structure are permissible for the design life of the structure.

8.8.10 Additional measures to reduce moisture migration should be implemented for floors that will receive moisture sensitive coverings. These include: 1) constructing a less pervious concrete floor slab by maintaining a water-cement ratio of 0.45 lb./lb. or less in the concrete for slabs-on-grade, 2) ensuring that all seams and utility protrusions are sealed with tape to create a "water tight" moisture barrier, 3) placing concrete walkways or pavements adjacent to the structure, 4) providing adequate drainage away from the structure, 5) moist cure the slabs for at least 7 days, and 6) locating lawns, irrigated landscape areas, and flower beds away from the structure.

8.8.11 The moisture vapor transmission through the slab should be tested at a frequency and method as specified by the flooring manufacturer. Vapor transmission results should be within floor manufacturers' specifications prior to placing flooring.

8.8.12 To avoid damaging slabs during construction the following recommendations are presented: 1) use perimeter pour-strips at tilt-wall locations to avoid damage to slab-wall connections; 2) design for a differential slab movement of ½ inch relative to interior columns; 3) provide at least 6 inches of aggregate base below the slabs, 4) it is expected that erection of concrete tilt-up wall panels and roof steel may require cranes. The loaded track and/or pad pressure of any crane which will operate on slabs or pavements should be considered in the design of the slabs and evaluated by the contractor prior to loading the slab. If cranes are to be used, the contractor should provide slab loading information to the slab design engineer to determine if the slab is adequate.

8.8.13 A perimeter pour strip between the wall footing and the adjacent interior slab should be incorporated into the project design. After the walls are erected and a majority of the differential movement has occurred, the pour strip should be placed.

8.8.14 Backfill the zone above the top of footings at interior column locations, building perimeters, and below the bottom of slabs with an approved backfill and/or an aggregate base section as recommended herein for the area below interior slabs-on-grade. This procedure should provide more uniform support for the slabs which may reduce the potential for cracking.

8.8.15 To provide a design modulus of subgrade reaction of 200 psi/in, the slabs should be supported on a minimum of 6 inches of Class 2 aggregate base material (R-value of 78). In addition, if concrete trucks will be traveling over the aggregate base material or the aggregate base will be used as a working surface, the contractor should determine an adequate aggregate base section thickness for the type and methods of construction proposed for the project. The aggregate base section may be included in the non-expansive engineered fill recommended below the floor slabs. The proposed compacted subgrade can experience instability under high frequency concrete truck loads during slab construction resulting in heaving and depressions in the subgrade during critical pours. This condition becomes more critical during wet winter and spring months. Often 6 inches of AB can reduce the potential for instability under the high frequency loading of concrete trucks. The improved support characteristics of the AB can be used in the design of the slab sections. Therefore, it is recommended to utilize a slab design with at least 6 inches of AB for constructability purposes and structural purposes.

8.9 Exterior Slabs-On-Grade

The recommendations for exterior slabs provided below are not intended for use for slabs subjected to vehicular traffic, rather lightly loaded sidewalks, curbs, and planters, etc. The slabs on the project to be prepared as exterior flatwork include: all sidewalks not including the store front, sidewalks adjacent to the building and other slabs adjacent to the building. Recommendations for concrete slabs subjected to vehicular traffic (impart a load on the subgrade soils of more than 150 pounds per square foot) are included in the Portland Cement Concrete section of this report.

8.9.1 Exterior slabs should be underlain by a minimum of 4 inches of Class 2 aggregate base underlain by a minimum of 8 inches of non-expansive, granular imported fill compacted to at least 95 percent. The exposed soils below the imported non-expansive soils should be excavated, conditioned and compacted as engineered fill (minimum 95 percent relative compaction). If any city, county, and/or state standards are cited on the plans or specifications, these standards should be in addition to the recommendations in this report.

8.9.2 The moisture content of the subgrade or engineered fill below the non-expansive section should be verified to be within optimum and three (3) percent above optimum moisture content prior to placing non-expansive fill, and also within 48 hours of placement of the slab-on-grade. If necessary to achieve the recommended moisture content, the subgrade could be over-excavated, conditioned (i.e., aerated, treated, etc.) as necessary and compacted as engineered fill.

8.9.3 Exterior improvements that subject the subgrade soils to a sustained load greater than 150 pounds per square foot should be prepared in accordance with recommendations presented in this report for foundations and floor slabs. Twining can provide alternative design recommendations for exterior slabs, if requested.

8.9.4 Since exterior sidewalks, curbs, etc. are typically constructed at the end of the construction process, the moisture conditioning conducted during earthwork can revert to natural dry conditions. Placing non-expansive materials and/or concrete walks and finish work over dry or slightly moist subgrade should be avoided. It is recommended that the general contractor notify the geotechnical engineer to conduct in-place moisture and density tests prior to placing non-expansive fill and concrete flatwork. Written test results indicating passing density and moisture tests should be in the general contractor's possession prior to placing concrete for exterior flatwork.

8.10 Asphaltic Concrete (AC) Pavements

8.10.1 The existing pavement sections do not comply with the Home Depot standard or heavy duty designs and have a projected design life of about 2 years or less given the type and frequency of traffic stated in Home Depot's criteria. Considering the range of pavement section thickness measured, it is estimated that an AC overlay of about 5¼ inches would be required to achieve the "standard duty" T. I. of 6.5 and an AC overlay of 7¼ inches would be required to achieve a "heavy duty" T. I. of 7.5. In our opinion, these types of overlays are not practical.

8.10.2 Contractors should be aware that areas proposed for pavements and slabs-on-grade adjacent to the proposed building and/or within the overbuild zone should incorporate the more stringent requirements for non-expansive soils and native soil moisture conditioning recommended in the interior slab-on-grade section of this report.

8.10.3 The contractor shall proof roll the subgrade of the areas to receive pavements prior to placement and compaction of the aggregate base (AB). All unstable areas should be removed, stabilized, and replaced with engineered fill under the observation of the Twining.

8.10.4 Pavement section design assumes that proper maintenance, such as sealing and repair of localized distress, will be performed on an as needed basis for longevity and safety.

8.10.5 Pavement materials and construction method should conform to Sections 25, 26, and 39 of the State of California Standard Specification Requirements.

8.10.6 The asphaltic-concrete should be compacted to an average relative compaction of 97 percent, with no single test value being below a relative compaction of 95 percent based on a 50-blow Marshall maximum density and a minimum joint density of 95 percent based on a 50-blow Marshall test.

8.10.7 The asphalt concrete should comply with Type "B" asphalt concrete as described in Section 39 of the State of California Standard Specification Requirements. It is recommended that an asphalt concrete mix design(s) be prepared and approved prior to construction.

8.10.8 If the paved areas are to be used during construction, or if the type and frequency of traffic are greater than assumed in design, the pavement section should be re-evaluated for the anticipated traffic.

8.10.9 The upper 12 inches of subgrade beneath aggregate base should be excavated, moisture-conditioned as necessary and compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557.

8.10.10The following pavement sections are based on an R-value of 20 and a traffic index of 6.5 for the "Standard Duty Pavements," and a traffic index of 7.5 for the "Heavy Duty Pavements."

Traffic Index = 6.5 "Standard Duty Pavements"

ALTERNATIVE	AC Thickness, inches	AB Thickness, inches (Min R-value = 78)	ASB Thickness, inches (Min R-value = 50)	Compacted Subgrade, inches
Two-layer	3.5	11.5	--	12
Three Layer	3.5	6.5	5.5	12

Traffic Index = 7.5 "Heavy Duty Pavements"

ALTERNATIVE	AC Thickness, inches	AB Thickness, inches (Min R-value = 78)	ASB Thickness, inches (Min R-value = 50)	Compacted Subgrade, inches
Two-layer	4.0	13.5	--	12
Three Layer	4.0	7.5	7.0	12

AC - Asphaltic Concrete compacted to an average of 97 percent relative compaction
AB - Aggregate Base compacted to at least 95 percent relative compaction (CAL test 216)
ASB - Aggregate Subbase compacted to at least 95 percent relative compaction (ASTM D-1557)
Subgrade - Subgrade soils compacted to at least 95 percent (ASTM D-1557) with moisture contents within 1 to 4 percent above optimum.

8.10.11 A geotextile fabric of Mirafi 500X, or equivalent, placed below the AB section can extend the life of the pavements. This is a suggestion for Home Depot U.S.A., Inc. to consider and is not intended to become a project requirement unless elected by Home Depot U.S.A., Inc. A geotextile fabric would help prolong the life of the pavements by preventing fine grained subgrade soils from migrating into the AB section.

8.10.12 Alternative pavement sections, such as Portland cement concrete, or equivalent asphaltic concrete sections may be used.

8.10.13 If actual pavement subgrade materials are significantly different from those tested for this study due to unanticipated grading or soil importing, the pavement section should be re-evaluated for the changed subgrade conditions.

8.10.14 It is recommended that the base 2 inch thick course of asphaltic concrete consist of a 3/4 inch maximum medium gradation. The top course or wear course should consist of a ½ inch maximum medium gradation. Mix designs should be provided to Home Depot and Twining for review and approval prior to placement of concrete

8.11 Portland Cement Concrete (PCC) Pavements

Recommendations for Portland Cement Concrete pavement structural sections are presented in the following subsections. These recommendations should be used for design and construction of the slab, the customer pickup slab, and the seasonal sales area. The PCC pavement design assumes a minimum modulus of rupture of 550 psi. It should be noted that the Home Depot U.S.A., Inc. criterion requires that PCC slabs within the building pad overbuild area (i.e., 5 feet outside the building perimeter or 5 feet beyond adjacent curblines, whichever is greater) should be designed as interior floor slabs or PCC pavements, whichever section is thicker or more stringent. A qualified design professional should specify where heavy duty and standard duty slabs are used based on the anticipated type and frequency of traffic.

8.11.1 The "standard duty" pavement section was designed based on an ADTT of 6 trucks per day. A design k-value of 200 psi/in was used considering a recommended 6-inch layer of Class 2 aggregate base material (R-value of 78) over the native compacted soils (the k-value of the native soils is approximately 150 psi/in).

Pavement Component	Thickness, Inches
Portland Cement Concrete	6.5
Class 2 Aggregate Base (95% Minimum Relative Compaction)	6.0
Compacted Subgrade (95% Minimum Relative Compaction)	12.0

8.11.2 The "heavy duty" pavement section was designed based on an ADTT of 26 trucks and a k-value of 200 psi/in considering a recommended 6-inch layer of Class 2 aggregate base material (R-value of 78).

Pavement Component	Thickness, Inches
Portland Cement Concrete	7.0
Class 2 Aggregate Base (95% Minimum Relative Compaction)	6.0
Compacted Subgrade (95% Minimum Relative Compaction)	12.0

8.11.3 The minimum truck dock, per Home Depot U.S.A., Inc., requirements are as follows:

Pavement Component	Thickness, Inches
Portland Cement Concrete	7.0
Class 2 Aggregate Base (95% Minimum Relative Compaction)	6.0
Compacted Subgrade (95% Minimum Relative Compaction	12.0

8.11.4 Stresses are anticipated to be greater at the edges and construction joints of the pavement section. A thickened edge is recommended on the outside of slabs subjected to wheel loads.

8.11.5 Joint spacing in feet should not exceed twice the slab thickness in inches, e.g., 12 feet by 12 feet for a 6-inch slab thickness. Regardless of slab thickness, joint spacing should not exceed 15 feet.

8.11.6 Lay out joints to form square panels. When this is not practical, rectangular panels can be used if the long dimension is no more than 1.5 times the short.

8.11.7 Control joints should have a depth of at least one-fourth the slab thickness, e.g., 1-inch for a 4-inch slab.

8.11.8 Isolation (expansion) joints should extend the full depth and should be used only to isolate fixed objects abutting or within paved areas. Construction joint location should be determined by the contractor's equipment and procedures.

8.11.9 Pavement section design assumes that proper maintenance such as sealing and repair of localized distress will be performed on a periodic basis.

8.11.10Pavement construction should conform to Sections 40 and 80 of the State of California Standard Specifications.

8.12 Temporary Excavations

8.12.1 It is the responsibility of the contractor to provide safe working conditions with respect to excavation slope stability. The contractor is responsible for site slope safety, classification of materials for excavation purposes, and maintaining slopes in a safe manner during construction.

8.12.2 Temporary excavations should be constructed in accordance with CAL OSHA requirements. Temporary cut slopes should not be steeper than 1.5:1, horizontal to vertical, and flatter if possible. If excavations cannot meet these criteria, the temporary excavations should be shored. Shallow groundwater seepage may cause unstable soil conditions, limit slopes to flatter than 1.5 to 1, and/or require shoring.

8.12.3 Shoring should be designed by an engineer with experience in designing shoring systems and registered in the State of California. The project geotechnical engineer should be provided with the shoring plan for review.

8.12.4 In no case should excavations extend below a 2H to 1V zone below existing utilities, foundations and/or floor slabs which are to remain after construction. Excavations which are required to be advanced below the 2H to 1V envelope should be shored to support the soils, foundations, and slabs.

8.12.5 Excavation stability should be monitored by the contractor. Slope gradient estimates provided in this report do not relieve the contractor of the responsibility for excavation safety. In the event that tension cracks or distress to the structure occurs, during or after excavation, the owners and Twining should be notified immediately and the contractor should take appropriate actions to minimize further damage or injury.

8.13 Utility Trenches

8.13.1 It should be anticipated that wet and unstable soils will likely be encountered during utility installations. These conditions, and measures to remove and dispose of water, and stabilize the soils and trenches, should be considered for bidding purposes by the contractor. The design engineers and the contractor should consider the buoyant conditions for design and construction of subsurface utilities and other structures. A groundwater depth of 5 feet or less (designer should assess how critical the depth to groundwater is for the design and use a shallower depth if this is a critical issue to the design) should be used by the design professionals for purposes of design. The Contractor should use a groundwater depth of 5 feet or less for bidding purposes (a shallower depth may be appropriate if the Contractor considers the depth to groundwater a critical aspect of the particular element of construction).

8.13.2 The trench width, type of pipe bedding, the type of initial backfill, and the compaction requirements of bedding and initial backfill material for utility trenches (storm drainage, sewer, water, electrical, gas, cable, phone, irrigation, etc.) should be specified by the project Civil Engineer or applicable design professional compliance with the manufacturer's requirements, governing requirements and this report, whichever is more stringent. For flexible polyvinylchloride (PVC) pipes, these requirements should be in accordance with the manufacturer's requirements or ASTM D-2321, whichever is more stringent. The width of the trench should provide sufficient space between the sidewall of the trench and the pipe to allow testing with a nuclear density gage (minimum 12 inches). The exposed bottom of the trench should be compacted to a minimum depth of 6 inches as engineered fill. As a minimum, the pipe bedding should consist of 4 inches of compacted (92 percent relative compaction) ASTM C-33 sand. The haunches and initial backfill (12 inches above the top of pipe) should consist of ASTM C-33 sand that is placed in maximum 6-inch thick lifts compacted to a minimum relative compaction of 92 percent using hand equipment. The final fill (12 inches above the pipe to the surface) should be non-expansive material compacted to a minimum of 92 percent relative compaction. All materials should be placed at one to four percent above optimum moisture content. The project civil engineer should take measures to control migration of moisture in the trenches such as slurry collars, etc.

8.13.3 If ribbed or corrugated pipes are used on the project, then the backfill should extend to at least 1 foot above the top of pipe or as required by the manufacturer, whichever is greater, to prevent damage to the pipe by the compaction operations above the pipe. Crushed gravel should be used below (bedding) and around the pipe and should be entirely encased in an approved geotextile fabric such as Mirafi 140 N or equivalent. However, a geotextile fabric would not be required if the granular materials consist of Caltrans Class 2 Permeable material. In either case, the sand, gravel, and/or Class 2 Permeable material should be densified using both vibratory and compaction equipment to achieve a non-yielding condition and a minimum relative compaction of 92 percent. The haunches should be hand tamped to achieve the required relative compaction. The maximum lift shall be 6 inches unless approved in writing by Twining. The backfill within the pipe zone should be a crushed gravel material placed and compacted in a manner to fill the irregular exterior surface of the pipe. The gravel should be compacted to a non-yielding condition under the observation of Twining. As an alternative, the pipe zone can be backfilled with a sand-cement slurry.

8.13.4 Utility trench backfill placed in or adjacent to building areas, exterior slabs or pavements should be moisture conditioned to within one to four percent above the optimum moisture content and compacted to at least 92 percent of the maximum dry density as determined by ASTM Test Method D1557. The contractor should use appropriate equipment and methods to avoid damage to utilities and/or structures during placement and compaction of the backfill materials.

8.13.5 When utility trench backfills are determined (by Twining) to be non-structural backfills, they should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method D1557.

8.13.6 Trench backfill should be placed in 8 inch lifts, moisture conditioned to within one to four percent above optimum and compacted to achieve the minimum relative compaction.

8.13.7 Approved imported engineered fill may be used as final backfill in trenches.

8.13.8 Jetting of trench backfill is not recommended to compact the backfill soils.

8.13.9 Where utility trenches extend from the exterior to the interior limits of a building, lean concrete should be used as backfill material for a minimum distance of 2 feet laterally on each side of the exterior building line to prevent the trench from acting as a conduit to exterior surface water.

8.13.10Storm drains and/or utility lines should be designed to be "watertight." If encountered, leaks should be immediately repaired. Leaking storm drain and/or utility lines could result in trench failure, sloughing and/or soil heave causing damage to surface and subsurface structures, pavements, flatwork, etc. In addition, landscaping irrigation systems should be monitored for leaks. It is recommended that the pipelines be inspected prior to placement of foundations, slabs-on-grade or pavements to verify that the pipelines are constructed properly and are "watertight."

8.13.11The plans should note that utility trenches for electrical lines, irrigation lines, etc. should be compacted to a minimum relative compaction of either 92 or 95 percent per ASTM D-1557, as required.

8.13.12The plans should note that utility trenches for electrical lines, irrigation lines, etc. should be compacted to a minimum relative compaction of either 92 or 95 percent per ASTM D-1557, as required.

8.13.13Utility trenches should not be constructed within a zone defined by a line that extends at an inclination of 2 horizontal to 1 vertical downward from the bottom of building foundations.

8.13.14The project Civil Engineer should include slurry type cutoff collars along utility trenches at critical locations to prevent the migration of surface water into the trench and along the trench backfill material. For bidding purposes, the contractor should assume for the project a minimum of eight (8) 8- inch wide collars with 1.5 cubic yards of 2-sack concrete per collar. The collars should extend a minimum of 6 inches into the trench sidewall and at least 5 feet above the top of pipe (as permitted based on the depth of the pipe).

8.14 <u>Corrosion Protection</u>

8.14.1 Based on the ASTM Special Technical Publication 741 and the analytical results of sample analyses indicate the samples had resistivity values of 2,600 and 2,100 ohm-cm, with a pH value of 7.7 for both samples. Based on the resistivity values, the soils exhibit a "corrosive" corrosion potential. Buried metal objects should be protected in accordance with the manufacturer's recommendations based on a "corrosive" corrosion potential. The evaluation was limited to the effects of soils to metal objects; corrosion due to other potential sources, such as stray currents and groundwater, was not evaluated. If piping or concrete are placed in contact with deeper soils or engineered fill, these soils should be analyzed to evaluate the corrosion potential of these soils.

8.14.2 Corrosion of concrete due to sulfate attack is not anticipated based on a "negligible" concentration of sulfates determined for the near-surface soils (Table 19-A-3 of the 2001 CBC). Therefore, no restrictions are required regarding the type, water-to-cement ratio, or strength of the concrete used for foundation and slabs are needed due to the sulfate content.

8.14.3 These soil corrosion data should be provided to the manufacturers or suppliers of materials that will be in contact with soils (pipes or ferrous metal objects, etc.) to provide assistance in selecting the protection and materials for the proposed products or materials. If the manufacturers or suppliers cannot determine if materials are compatible with the soil corrosion conditions, a professional consultant, i.e., a corrosion engineer, with experience in corrosion protection should be consulted to design parameters. Twining is not a corrosion engineer; thus, cannot provide recommendations for mitigation of corrosive soil conditions. It is recommended that a corrosion engineer be consulted for the site specific conditions.

9.0 DESIGN CONSULTATION

9.1 Twining should be provided the opportunity to review those portions of the contract drawings and specifications that pertain to earthwork operations and foundations prior to finalization to determine whether they are consistent with our recommendations. This service is part of this current contractual agreement.

9.2 It is the client's responsibility to provide plans and specification documents for our review prior to their issuance for construction bidding purposes.

9.3 If Twining is not afforded the opportunity for review, we assume no liability for the misinterpretation of our conclusions and recommendations. This review is documented by a formal plan/specification review report provided by Twining.

10.0 CONSTRUCTION MONITORING

10.1 It is recommended that Twining be retained to observe the excavation, earthwork, and foundation phases of work to determine that the subsurface conditions are compatible with those used in the analysis and design.

10.2 Twining can conduct the necessary observation and field testing to provide results so that action necessary to remedy indicated deficiencies can be taken in accordance with the plans and specifications. Upon completion of the work, we will provide a written summary of our observations, field testing and conclusions regarding the conformance of the completed work to the intent of the plans and specifications. This service is not, however, part of this current contractual agreement.

10.3 Compaction tests should be conducted at a frequency of at least:

Area	Minimum Test Frequency
Mass Fills or Subgrade	1 test per 2,000 square feet per compacted 6-inch lift
Pavement Subgrade	1 test per 5,000 square feet per compacted 6-inch lift
Utility Lines	1 test per 150 feet per 6-inch lift

11.0 NOTIFICATION AND LIMITATIONS

11.1 The conclusions and recommendations presented in this report are based on the information provided regarding the proposed construction, and the results of the field and laboratory investigation, combined with interpolation of the subsurface conditions between boring locations.

11.2 The nature and extent of subsurface variations between borings may not become evident until construction.

11.3 If variations or undesirable conditions are encountered during construction, Twining should be notified promptly so that these conditions can be reviewed and our recommendations reconsidered where necessary. It should be noted that unexpected conditions frequently require additional expenditures for proper construction of the project.

11.4 If the proposed construction is relocated or redesigned, or if there is a substantial lapse of time between the submission of our report and the start of work (over 12 months) at the site, or if conditions have changed due to natural cause or construction operations at or adjacent to the site, the conclusions and recommendations contained in this report should be considered invalid unless the changes are reviewed and our conclusions and recommendations modified or approved in writing.

11.5 Changed site conditions, or relocation of proposed structures, may require additional field and laboratory investigations to determine if our conclusions and recommendations are applicable considering the changed conditions or time lapse.

11.6 The conclusions and recommendations contained in this report are valid only for the project discussed in Section 3.4, Anticipated Construction. The use of the information and recommendations contained in this report for structures on this site not discussed herein or for structures on other sites not discussed in Section 3.1, Site Description is not recommended. The entity or entities that use or cause to use this report or any portion thereof for another structure or site not covered by this report shall hold Twining, its officers and employees harmless from any and all claims and provide Twining's defense in the event of a claim.

11.7 This report is issued with the understanding that it is the responsibility of the client to transmit the information and recommendations of this report to developers, owners, buyers, architects, engineers, designers, contractors, subcontractors, and other parties having interest in the project so that the steps necessary to carry out these recommendations in the design, construction and maintenance of the project are taken by the appropriate party.

11.8 This report presents the results of a geotechnical engineering investigation only and should not be construed as an environmental audit or study.

11.9 Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally-accepted engineering principles and practices in the City of Huntington Beach as of November 2004. This warranty is in lieu of all other warranties either expressed or implied.

11.10 Reliance on this report by a third party (i.e., that is not a party to our written agreement) is at the party's sole risk. If the project and/or site are purchased by another party, the purchaser must obtain written authorization and sign an agreement with Twining in order to rely upon the information provided in this report for design or construction of the project.

We appreciate the opportunity to be of service to Home Depot U.S.A., Inc. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience.

Sincerely,

THE TWINING LABORATORIES, INC.

DRAFT

Vasiliy V. Parfenov, RG 7699
Project Geologist
Geotechnical Engineering Division

DRAFT

Read L. Andersen, RCE
Manager
Geotechnical Engineering Division

DRAFT

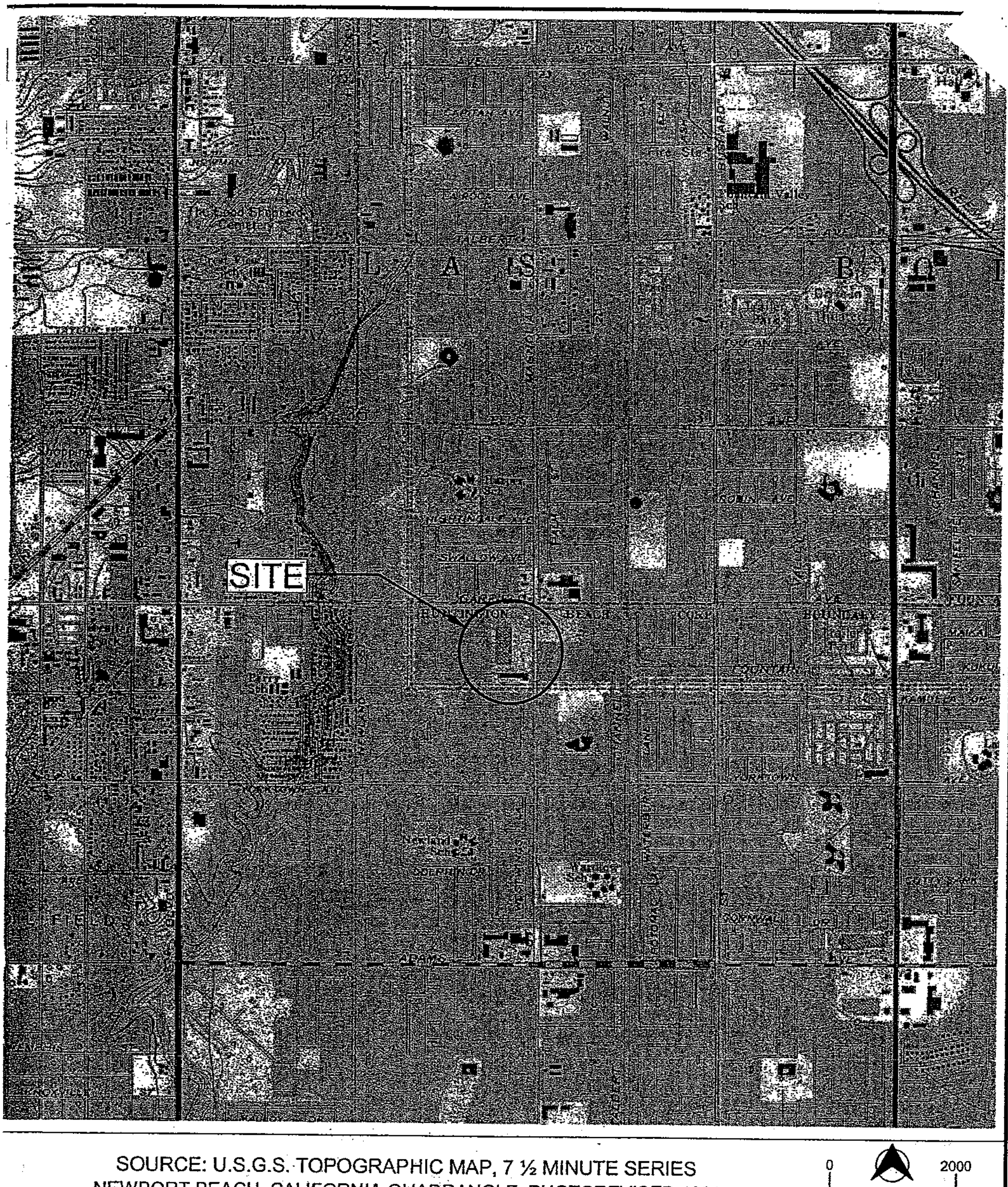
Harry D. Moore, RCE, RGE
President

HDM/JMK/VVP/id
F:\ENG\Geotech\D05094.02 Huntington Beach\094.02HomeDepotHuntngtonBeachDraftGEIRrevisedforteardown.wpd

APPENDIX A

APPENDIX A

DRAWINGS



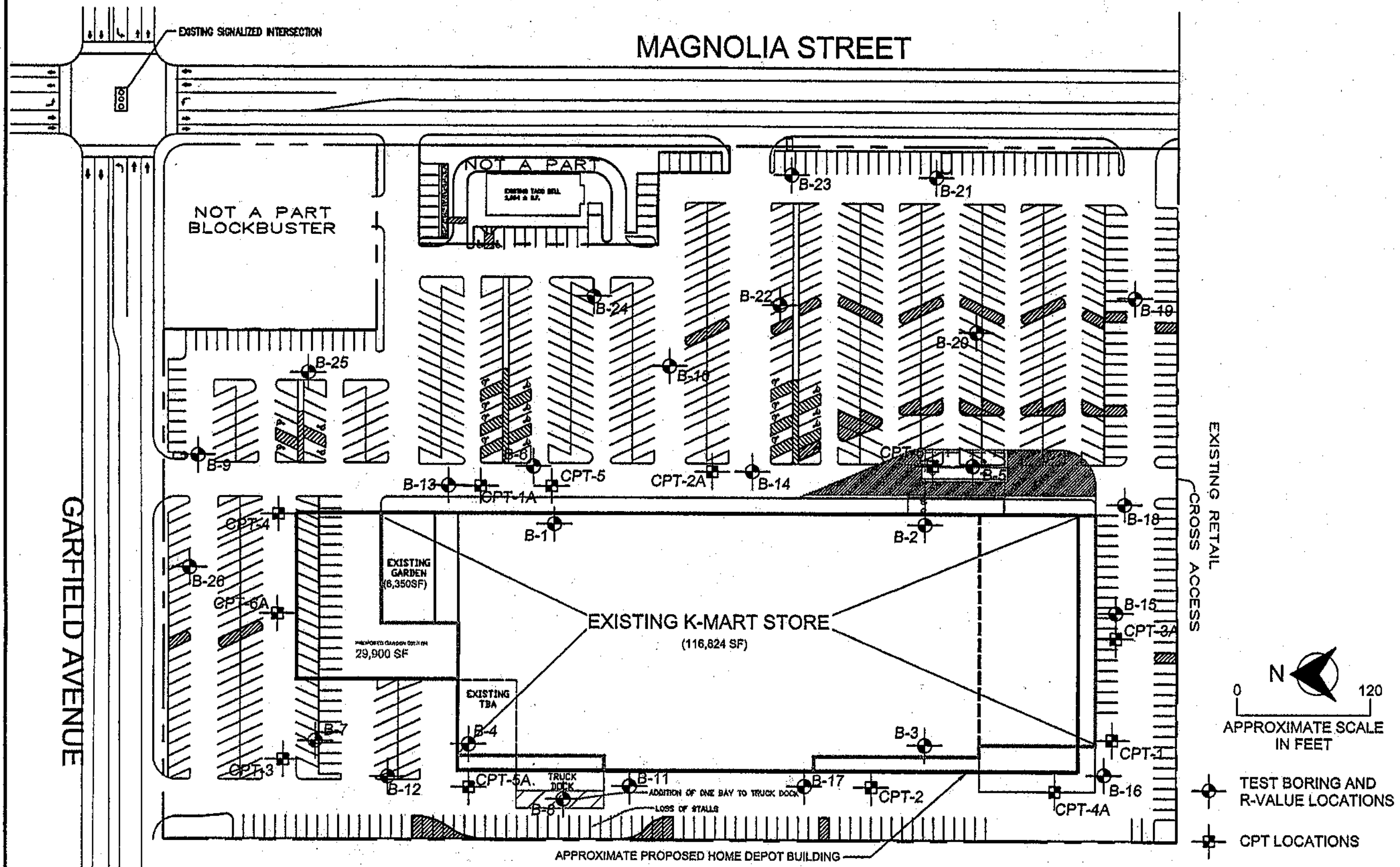
SOURCE: U.S.G.S. TOPOGRAPHIC MAP, 7 ½ MINUTE SERIES
NEWPORT BEACH, CALIFORNIA QUADRANGLE, PHOTOREVISED 1981

0 2000
APPROXIMATE SCALE IN FEET

SITE LOCATION MAP
PROPOSED HOME DEPOT STORE
19101 MAGNOLIA STREET
HUNTINGTON BEACH, CALIFORNIA

FILE NO.: 05094-01-01	DATE: 06/10/04
DRAWN BY: WME	APPROVED BY:
PROJECT NO. D05094.01	DRAWING NO. 1

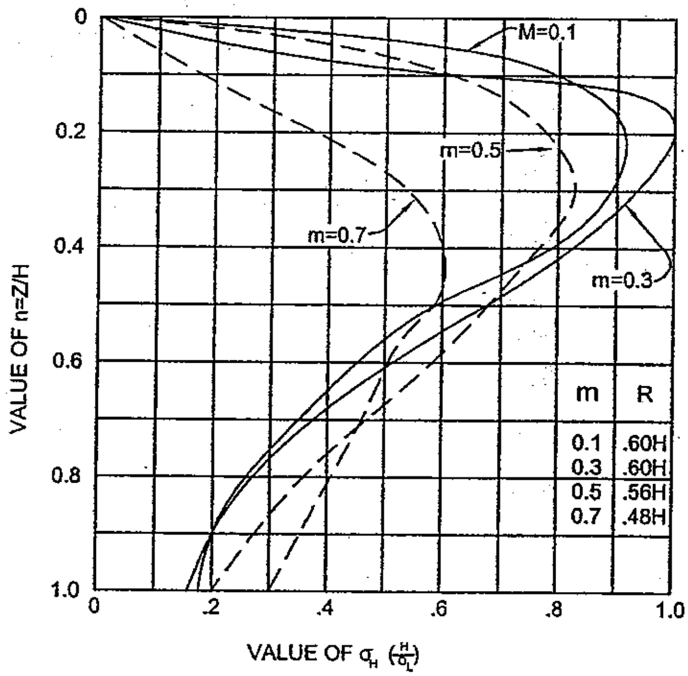
THE TWINING LABORATORIES, INC.
EST. 1898
FRESNO/MODESTO/VISALIA/BAKERSFIELD/MONTEREY

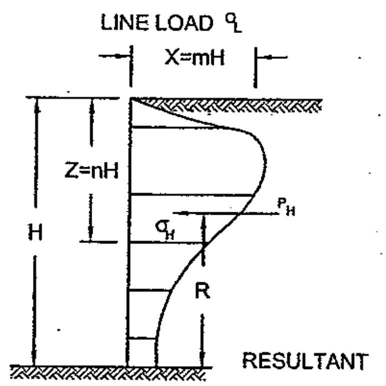


TEST BORING,CPT, AND R-VALUE LOCATIONS
PROPOSED HOME DEPOT STORE
HUNTINGTON BEACH, CALIFORNIA

FILE NO. 05094-02	DATE DRAWN: 11/24/04
DRAWN BY: WME	APPROVED BY:
PROJECT NO. D05094.02	DRAWING NO. 2

THE TWINING LABORATORIES, INC.
EST.1898
FRESNO/MODESTO/VISALIA/BAKERSFIELD/MONTEREY





FOR m ≦ 0.4:

$$\sigma_H\left(\frac{H}{Q_L}\right) = \frac{0.20n}{(0.16 + n^2)^2}$$

$$P_H = 0.55 Q_L$$

FOR m > 0.4:

$$\sigma_H\left(\frac{H}{Q_L}\right) = \frac{1.28m^2 n}{(m^2+n^2)^2}$$

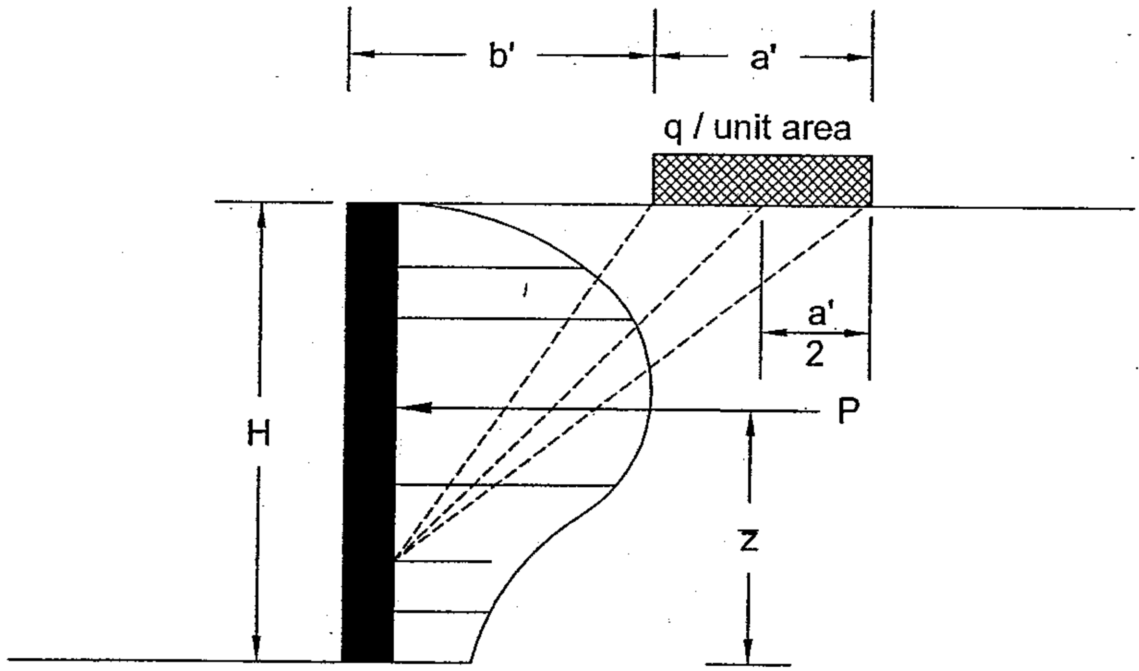
$$P_H = \frac{0.64 Q_L}{(m^2+1)}$$

PRESSURES FROM LINE LOAD Q_L

(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)

HORIZONTAL PRESSURES ON RIGID WALL FROM LINE LOAD

TYPICAL LINE SURCHARGE DIAGRAM PROPOSED HOME DEPOT STORE HUNTINGTON BEACH, CALIFORNIA	FILE NO. TYPLINE	DATE DRAWN: 07/02/04	THE TWINING LABORATORIES, INC. EST. 1898 FRESNO/MODESTO/VISALIA/BAKERSFIELD/MONTEREY
	DRAWN BY: WME	APPROVED BY:	
	PROJECT NO. D05093.01	DRAWING NO. 3	



The total force per unit length (P) and the location of the resultant force, $\bar{z}$, due to the strip loading only can be expressed as follows:

$$\boxed{P=\frac{q}{90}[H(0_1-0_2)]}$$

where $0_1=\tan^{-1}(\frac{b'}{H})$ in degrees

$0_2=\tan^{-1}(\frac{a'+b'}{H})$ in degrees

$$\bar{z}=\frac{H^2(0_1-0_2)-(R-Q)-57.30a'H}{2H(0_1-0_2)}$$

where $R=(a'+b')^2(90-0_2)$

$Q=b'^2(90-0_1)$

REF: DAS, BRAJA M. (1990). PRINCIPLES OF FOUNDATION ENGINEERING, 2nd Ed., PWS-KENT

TYPICAL UNIFORM SURCHARGE DIAGRAM PROPOSED HOME DEPOT STORE HUNTINGTON BEACH, CALIFORNIA	FILE NO.: TYPUNIF	DATE: 07/02/04	THE TWINING LABORATORIES, INC. EST. 1898 FRESNO/MODESTO/VISALIA/BAKERSFIELD/MONTEREY
	DRAWN BY: WME	APPROVED BY:	
	PROJECT NO. D05093.01	DRAWING NO. 4	

APPENDIX B

APPENDIX B

LOGS OF BORINGS AND CONE PENETROMETER TESTING

This appendix contains the final logs of borings and CPTs. These logs represent our interpretation of the contents of the field logs and the results of the field and laboratory tests.

The logs and related information depict subsurface conditions only at these locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these test boring locations. Also, the passage of time may result in changes in the soil conditions at these test boring locations.

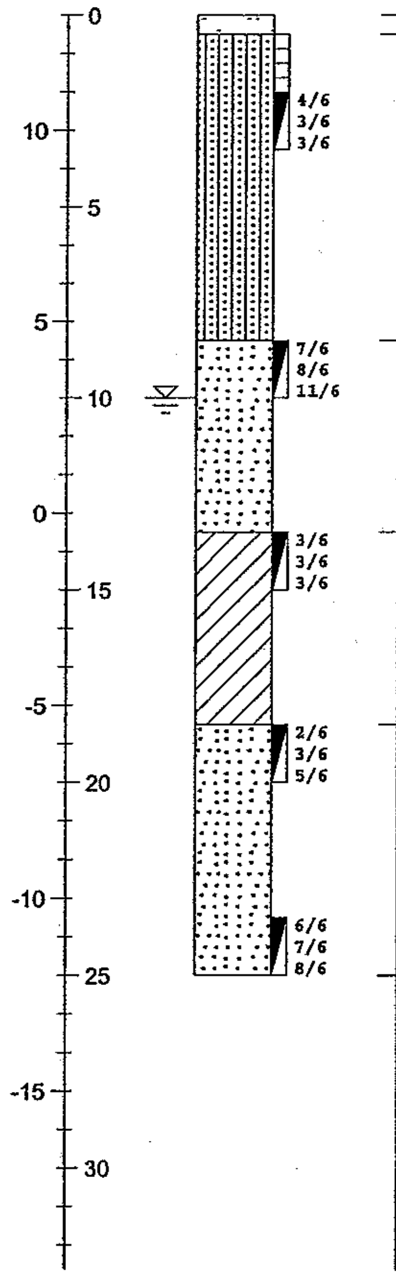
In addition, an explanation of the abbreviations used in the preparation of the logs and a description of the Unified Soil Classification System are provided at the end of Appendix B.

THE TWINING LABORATORIES, INC. EST. 1898

SOIL TEST BORING SYMBOLIC LOG

BORING B-1

Project: Home Depot Remodel
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 06/17/2004
Logged By: J. Thatch
Elevation: 13 Feet AMSL
Drilled By: Pacific Drilling
Depth to Groundwater: 10 Feet
Drill Type: Beaver Tri-Pod
Cased to Depth: N/A
Auger Type: 6" O.D. Solid Flight Auger
Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
		PCC	Portland Cement Concrete = 6 inches			
		SM	SAND, Silty; medium dense, damp, olive brown, with trace clay At 2 Feet - Loose, moist, with clay	DD = 102 pcf	– 6	17 15
		SP	SAND, Poorly Graded; medium dense, wet, fine, olive to light brown, with silt and little clay		19	28
		CL	LEAN CLAY, Sandy; medium stiff, moist, gray to brown, with trace gravel		6	43
		SP	SAND, Poorly Graded; loose, wet, gray, with clay and silt		8	32
			Medium dense		15	30
			Bottom of Boring at 25 Feet			

Notes:

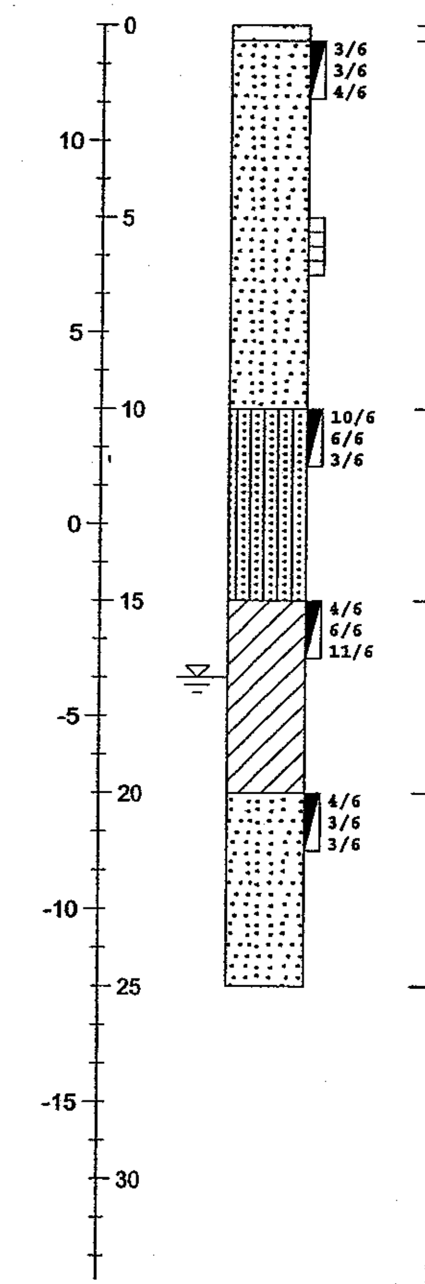
Figure Number B-1

THE TWINING LABORATORIES, INC. EST. 1896

SOIL TEST BORING SYMBOLIC LOG

BORING B-2

Project: Home Depot Remodel
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 06/17/2004
Logged By: J. Thatch
Elevation: 13 Feet AMSL
Drilled By: Pacific Drilling
Depth to Groundwater: 17 Feet
Drill Type: Beaver Tri-Pod
Cased to Depth: N/A
Auger Type: 6" O.D. Solid Flight
Hammer Type: Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		PCC	Portland Cement Concrete = 5 inches			
	3/6 3/6 4/6	SP	SAND, Poorly Graded; loose, damp, light, olive brown, with little silt and trace clay		7	9
5		SP	Medium dense, light brown	DD = 94 pcf -200 = 4%	--	3
10	10/6 6/6 3/6	SM	SAND, Silty; loose, moist, light, olive brown, with clay		9	28
15	4/6 6/6 11/6	CL	LEAN CLAY; very stiff, moist, low plasticity, olive gray to brown, with little sand		17	49
20	4/6 3/6 3/6	SP	SAND, Poorly Graded; loose fine, wet, with little silt		6	37
25			Bottom of Boring at 25 Feet			

Notes:

Figure Number B-2

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-3

Project: Home Depot Remodel

Project Number: TL D05094.02

Location: Huntington Beach, CA

Date: 06/17/2004

Logged By: J. Thatch

Elevation: 13 Feet AMSL

Drilled By: Pacific Drilling

Depth to Groundwater: 16 Feet

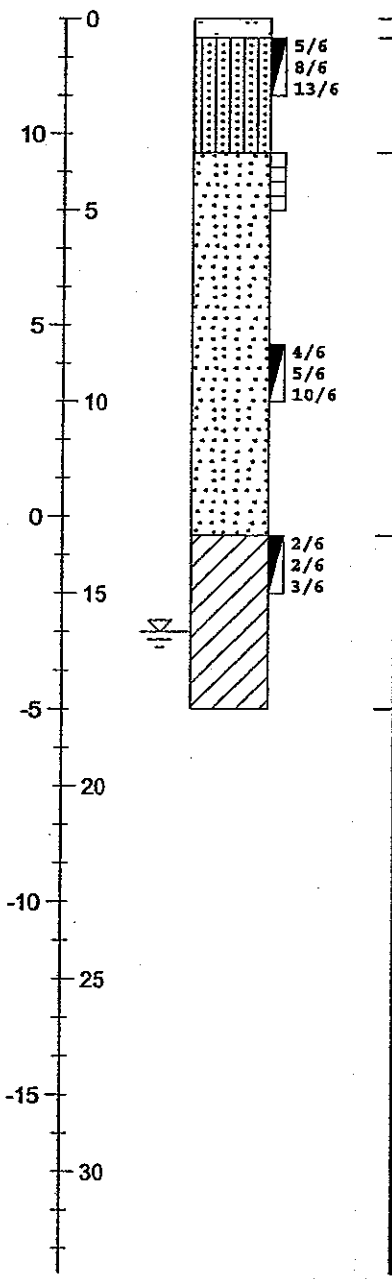
Drill Type: Beaver Tri-Pod

Cased to Depth: N/A

Auger Type: 6" O.D. Solid Flight

Hammer Type: Trip

ELEVATION/ DEPTH (feet) / **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-value	Moisture Content %
PCC	Portland Cement Concrete = 6.5 inches			
SM	SAND, Silty; medium dense, damp, olive brown, with trace clay		21	17
SP	SAND, Poorly Graded; loose, damp, fine, olive, brown with silt	DD = 78 pcf	--	31
	Medium dense, with little silt		15	31
CL	LEAN CLAY, medium stiff, wet, low plasticity, dark olive brown to gray		5	40
	Bottom of Boring at 18 Feet			

Notes:

Figure Number B-3

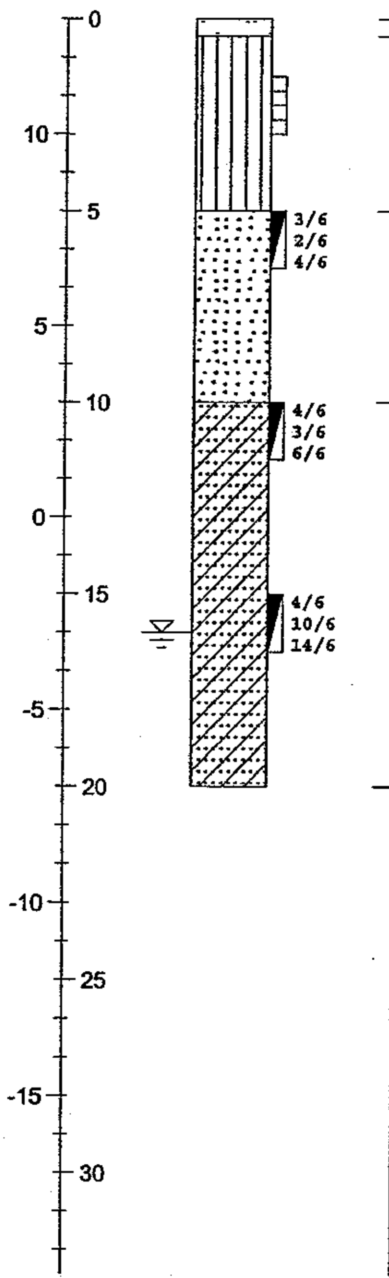
SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-4

Project: Home Depot Remodel
Location: Huntington Beach, CA
Logged By: J. Thatch
Drilled By: Pacific Drilling
Drill Type: Beaver Tri-Pod
Auger Type: 6" O.D. Solid Flight

Project Number: TL D05094.02
Date: 06/17/2004
Elevation: 13 Feet AMSL
Depth to Groundwater: 16 Feet
Cased to Depth: N/A
Hammer Type: Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		PCC	Portland Cement Concrete = 5.5 inches	DD = 79 pcf ø = 21° C = 287 psf -200 = 86%		31
		ML	SILT, Sandy; non plastic, damp, dark olive brown with trace clay		–	
5	3/6 2/6 4/6	SP	SAND, Poorly Graded; loose, damp, light brown, with 2 to 3 inch layers of lean clay		6	29
10	4/6 3/6 6/6	SC	SAND, Clayey; loose, moist, olive brown with little silt		9	33
15	4/6 10/6 14/6		Medium dense, wet		24	28
20			Bottom of Boring at 20 Feet			

Notes:

Figure Number B-4

THE TWINING LABORATORIES, INC. EST. 1898

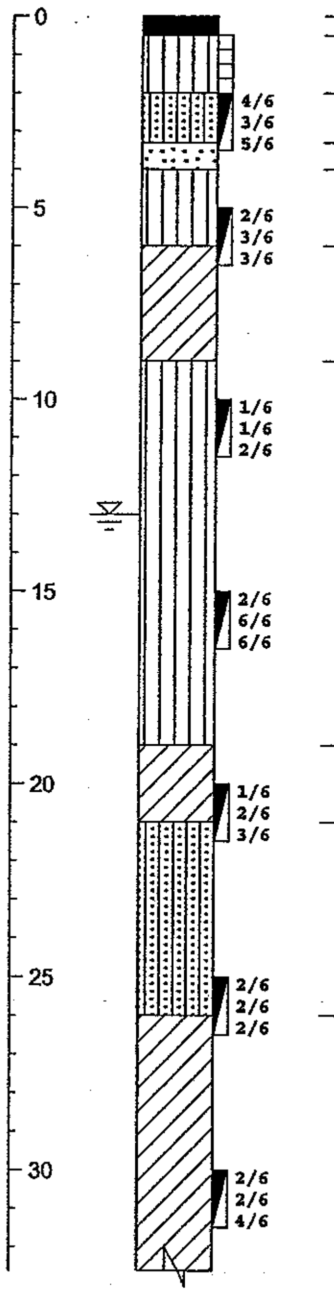
SOIL TEST BORING SYMBOLIC LOG

BORING B-5

Project: Home Depot Remodel
Location: Huntington Beach, CA
Logged By: D. Ledgerwood
Drilled By: T. Conley
Drill Type: CME 75
Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02
Date: 06/17/2004
Elevation: N/A
Depth to Groundwater: 13 Feet
Cased to Depth: N/A
Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
		AC	Asphaltic Concrete = 3 inches	DD = 103 pcf		
		ML	Aggregate Base = 2.5 inches		–	12
		SM	At 0.5 Feet - SILT, Sandy; medium stiff, moist, slightly plastic, olive brown		8	9
		SP	At 2 Feet - SAND, Silty; loose, moist, fine, brown			
		ML	At 3.3 Feet - SAND, Poorly Graded; loose, damp, fine, pale brown		6	37
		CL	At 4 Feet - SILT, Sandy; medium stiff, moist, non-plastic, gray mottled with reddish brown			
		ML	At 6 Feet - LEAN CLAY, medium stiff, moist, low plasticity, green		3	25
			At 9 Feet - SILT, Sandy; soft, moist, non- plastic, gray Stiff, wet, gray to dark gray	-200 = 82%	12	26
		CL	LEAN CLAY, Sandy; soft, wet, low plasticity, grayish blue, trace sea shell fragments		5	60
		SM	SAND, Silty; loose, wet, fine, grayish blue		4	57
		CL	LEAN CLAY; soft, wet, low plasticity, grayish blue, trace fine sands, trace wood fibers Medium stiff, increase in percent sand		6	25



Notes:

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-5

Project: Home Depot Remodel

Project Number: TL D05094.02

Location: Huntington Beach, CA

Date: 06/17/2004

Logged By: D. Ledgerwood

Elevation: N/A

Drilled By: T. Conley

Depth to Groundwater: 13 Feet

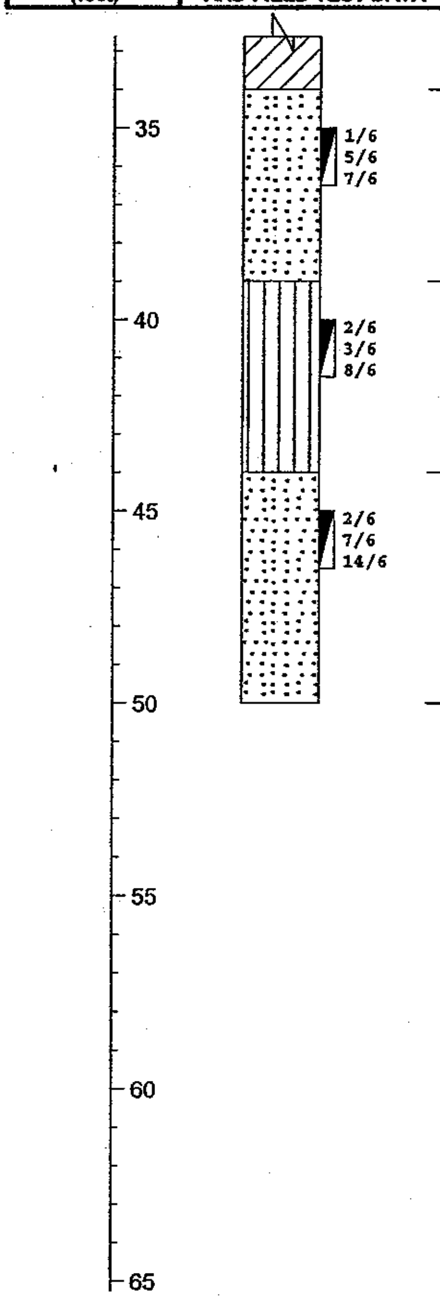
Drill Type: CME 75

Cased to Depth: N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Hammer Type: Trip

ELEVATION/ DEPTH (feet) — **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-value	Moisture Content %
SP	SAND, Poorly Graded, medium dense, wet, fine to medium, grayish blue	-200 = 11%	12	27
ML	SILT, Sandy; stiff, wet, slightly plastic, olive brown to grayish blue		11	34
SP	SAND, Poorly Graded, medium dense, wet, fine to medium, light brown	-200 = 8%	21	22
	Bottom of Boring at 50 Feet			

Notes:

Figure Number B-5

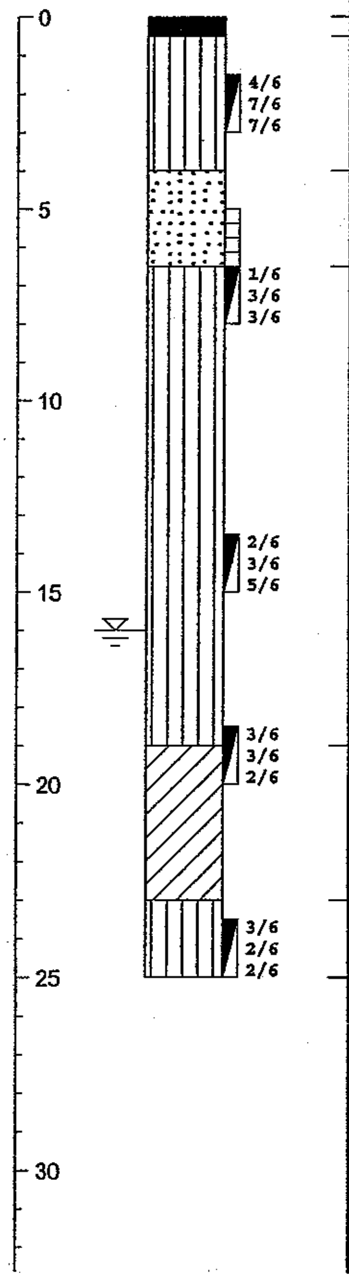
SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-6

Project: Home Depot Remodel
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 06/17/2004
Logged By: D. Ledgerwood
Elevation: N/A
Drilled By: T. Conley
Depth to Groundwater: 16 Feet
Drill Type: CME 75
Cased to Depth: N/A
Auger Type: 6 5/8" O.D. Hollow Stem Auger
Hammer Type: Trip

ELEVATION/ DEPTH (feet) — SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA



USCS	Soil Description	Remarks	N-value	Moisture Content %
AC	Asphaltic Concrete = 2.25 inches			
ML	Aggregate Base = 3.5 inches SILT, Sandy; stiff, moist, slightly plastic, brown		14	10
SP	SAND, Poorly Graded; loose, damp, fine, yellow brown	DD = 69 pcf	--	25
ML	SILT, Sandy, medium stiff, moist, non-plastic, brown, trace clay		6	32
	Slightly plastic, grayish blue			
			8	39
CL	LEAN CLAY, Sandy; medium stiff, wet, low plasticity, grayish blue		5	35
ML ML	SILT; soft, wet, slightly plastic, grayish blue, trace clay	PI = 1% LL = 28% SILT = 68% CLAY = 28% SAND = 4%	4	27
	Bottom of Boring at 25 Feet			

Notes:

Figure Number B-6

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-7

Project: Home Depot Remodel

Location: Huntington Beach, CA

Logged By: D. Ledgerwood

Drilled By: T. Conley

Drill Type: CME 75

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02

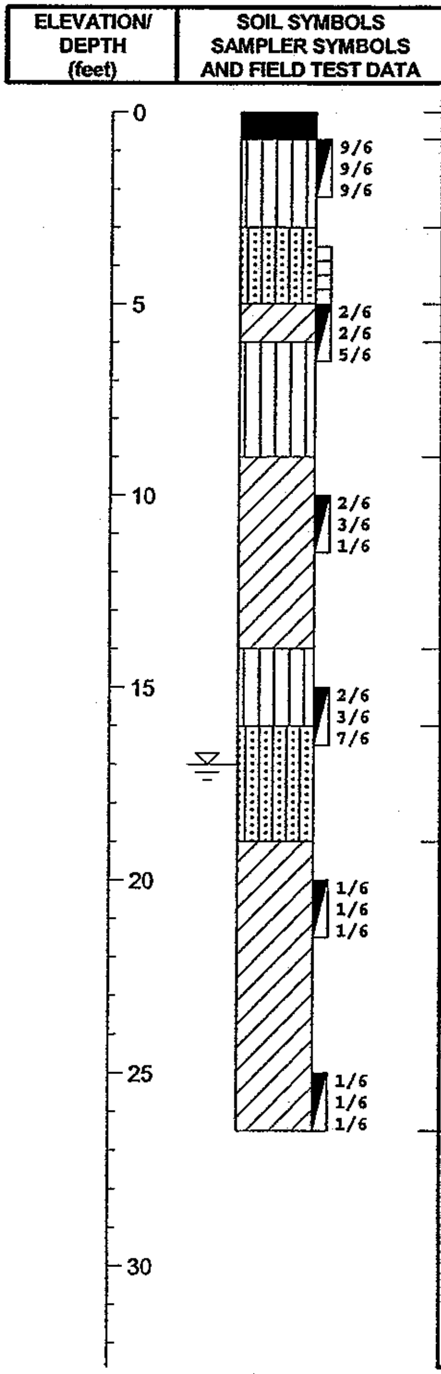
Date: 06/17/2004

Elevation: N/A

Depth to Groundwater: 17 Feet

Cased to Depth: N/A

Hammer Type: Trip



USCS	Soil Description	Remarks	N-value	Moisture Content %
AC	Asphaltic Concrete = 3.25 inches			
ML	Aggregate Base = 3.5 inches		18	12
	At 0.7 Feet - SILT, Sandy; very stiff, damp, non-plastic, brown to light brown			
SM	At 3 Feet - SAND, Silty; loose, damp, fine, yellow brown	DD = 87 pcf -200 = 12%	--	5
CL	At 5 Feet - LEAN CLAY; medium stiff, moist, low plasticity, grayish brown, trace fine sands		7	28
ML	AT 6 Feet - SILT; Sandy; medium stiff, moist, slightly plastic, grayish brown			
CL	At 9 Feet - LEAN CLAY, soft, moist to wet, low plasticity, grayish blue, trace fine sands		4	34
ML	SILT, Sandy; stiff, wet, non plastic, gray to grayish blue		10	33
SM	SAND, Silty; loose, wet, fine, gray			
CL	LEAN CLAY, very soft, wet, low plasticity, grayish blue, with sea shell fragments, trace wood fibers		2	41
	No sea shell fragments, with silt		2	38
	Bottom of Boring at 26.5 Feet			

Notes:

Figure Number B-7

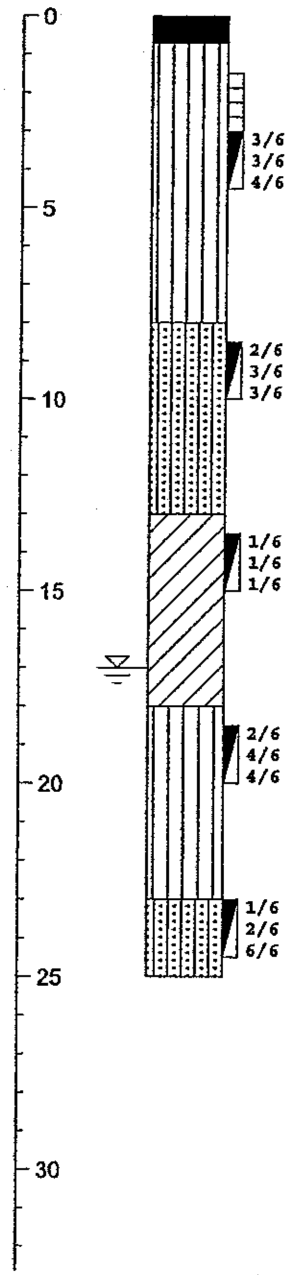
THE TWINING LABORATORIES, INC. EST. 1898

SOIL TEST BORING SYMBOLIC LOG

BORING B-8

Project: Home Depot Remodel
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 06/17/2004
Logged By: D. Ledgerwood
Elevation: N/A
Drilled By: T. Conley
Depth to Groundwater: 17 Feet
Drill Type: CME 75
Cased to Depth: N/A
Auger Type: 6 5/8" O.D. Hollow Stem Auger
Hammer Type: Trip

ELEVATION/ DEPTH (feet) — SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA



USCS	Soil Description	Remarks	N-value	Moisture Content %
AC	Asphaltic Concrete = 2 inches			
ML	Aggregate Base = 5.5 inches			
ML	SILT, Sandy; medium stiff, moist, slightly plastic, grayish brown, trace organic smell At 1.5 Feet - No organic smell At 3.5 Feet - 2 inch lean clay lens	DD = 95 pcf -200 = 77%	– 7	20 16
SM	SAND, Silty; loose, moist, fine, dark gray, trace clay		6	30
CL	LEAN CLAY; very soft, wet, low plasticity, gray with grayish brown, trace fine sands		2	44
ML	SILT, Sandy; medium stiff, wet, slightly plastic, grayish blue, interbedded with fine sands, trace clay		8	34
SM	SAND, Silty; loose, wet, fine, grayish blue	-200 = 38%	8	30
	Bottom of Boring at 25 Feet			

Notes:

Figure Number B-8

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-9

Project: Home Depot Remodel

Location: Huntington Beach, CA

Logged By: J. Thatch

Drilled By: Pacific Drilling

Drill Type: CME 75

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02

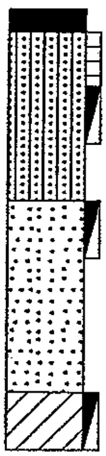
Date: 06/17/2004

Elevation: N/A

Depth to Groundwater: N/E

Cased to Depth: N/A

Hammer Type: Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 2.5 inches			
		SM	Aggregate Base = 4.5 inches	DD = 105 pcf	--	17
	2/6 3/6 5/6		SAND, Silty; damp, olive brown, with trace clay At 2 Feet - Loose, damp, light brown to olive brown		8	22
5	3/6 3/6 3/6	SP	SAND, Poorly Graded; loose, damp, light brown, with trace fines		6	30
10	1/6 2/6 3/6	CL	LEAN CLAY, Sandy; medium stiff, damp, low palsticity, dark gray		5	35
			Bottom of Boring at 11.5 Feet			
15						
20						
25						
30						

Notes:

Figure Number B-9

THE TWINING LABORATORIES, INC. EST. 1898

SOIL TEST BORING SYMBOLIC LOG

BORING B-10

Project: Home Depot Remodel

Project Number: TL D05094.02

Location: Huntington Beach, CA

Date: 06/17/2004

Logged By: J. Thatch

Elevation: N/A

Drilled By: Pacific Drilling

Depth to Groundwater: 9 Feet

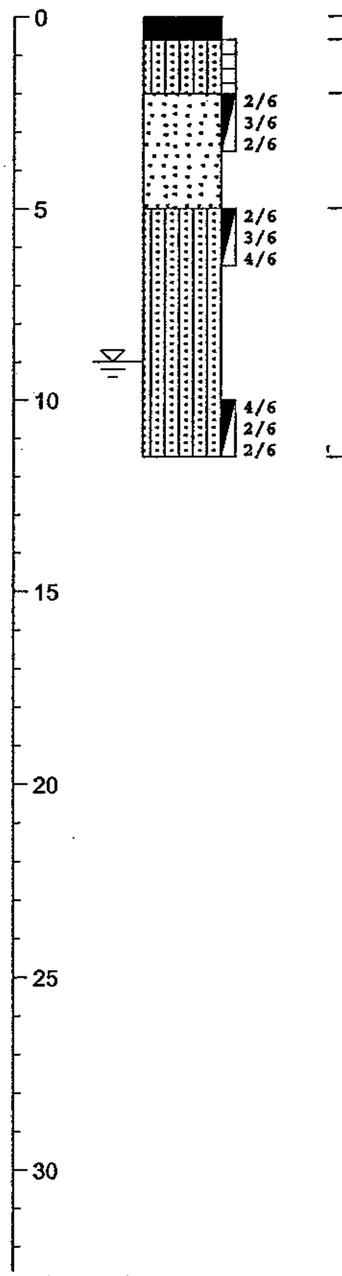
Drill Type: CME 75

Cased to Depth: N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA



USCS	Soil Description	Remarks	N-value	Moisture Content %
AC	Asphaltic Concrete = 2.5 inches	DD = 99 pcf		
SM	Aggregate Base = 5 inches		–	15
SP	SAND, Silty; loose, damp, light brown to dark brown, with trace clay		5	13
	SAND, Poorly Graded; loose, damp, light brown, with little silt			
SM	SAND, Silty; loose, damp, light brown with little clay		7	28
	Very loose, wet, dark brown to gray		4	35
	Bottom of Boring at 11.5 Feet			

Notes:

Figure Number B-9

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-10

Project: Home Depot

Location: Huntington Beach, CA

Logged By: D. Ledgerwood

Drilled By: T. Conley

Drill Type: CME 75

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02

Date: 6/17/04

Elevation: N/A

Depth to Groundwater: 9 Feet

Cased to Depth: N/A

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 2.5 inches			
		SM	Aggregate Base = 5 inches		–	
	2/6 3/6 2/6	SP	SAND, Silty; loose, damp, light brown to dark brown, with trace clay		5	
			SAND, Poorly Graded; loose, damp, light brown, with little silt			
5	2/6 3/6 4/6	SM	SAND, Silty; loose, da,p, light brown, with little clay		7	
10	4/6 2/6 2/6		Wet, dark brown to gray		4	
			Bottom of Boring at 11.5 feet			
15						
20						
25						
30						

Notes:

Figure Number B-10

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-11

Project: Home Depot
Location: Huntington Beach, CA
Logged By: H. Elbadri
Drilled By: T. Conley
Drill Type: CME 75
Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02
Date: 11/05/04
Elevation: N/A
Depth to Groundwater: 18 Feet
Cased to Depth: N/A
Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 3 inches			
		ML	Aggregate Base = 6 inches			
			SILT, Sandy; firm, moist, dark gray	DD = 101.1 pcf	--	15
	4/6 4/6 3/6				7	25
5	3/6 2/6 2/6		SILT, Clayey; soft, moist, black		4	36
10	2/6 1/6 1/6	SP	SAND, Poorly Graded; fine, very loose, moist, brown		2	26
15	1/6 1/6 1/6	ML	SILT, Clayey; soft, moist, wet, brown		2	27
20	1/6 2/6 2/6		SILT, Sandy, Poorly Graded; fine, loose, wet, dark brown	-200 = 88.4%	4	36
25	3/6 2/6 2/6		Increase in silt content		4	32
30	1/6 2/6 7/6		Sand, loose, medium to fine, wet, gray		9	26

Notes:

Figure Number B-11

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-11

Project: Home Depot

Location: Huntington Beach, CA

Logged By: H. Elbadri

Drilled By: T. Conley

Drill Type: CME 75

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02

Date: 11/05/04

Elevation: N/A

Depth to Groundwater: 18 Feet

Cased to Depth: N/A

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
35	2/6 2/6 5/6	ML	SILT, Clayey; firm, wet, gray		7	35
40	3/6 2/6 3/6	SP-SM	SAND, fine, loose, wet, gray		5	22
45			Sand heaving into auger below 45 feet			
50			Bottom of Boring at 50 feet			
55						
60						
65						

Notes:

Figure Number B-11

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-12

Project: Home Depot
Project Number: TL D05094.02

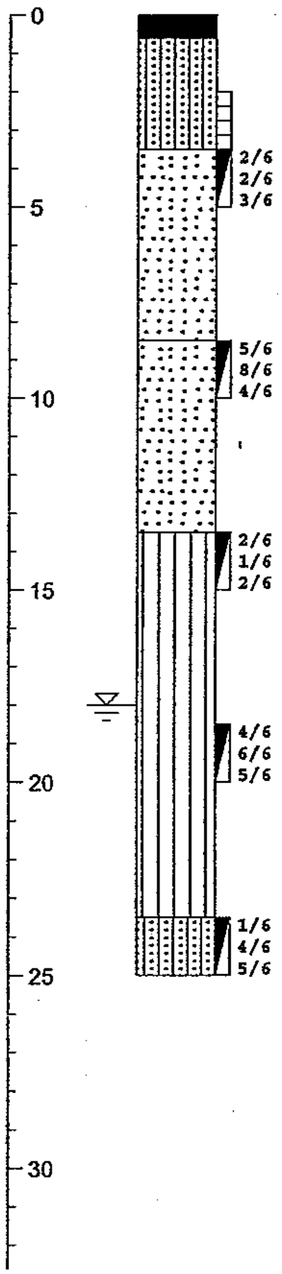
Location: Huntington Beach, CA
Date: 11/05/04

Logged By: H. Elbadri
Elevation: N/A

Drilled By: T. Conley
Depth to Groundwater: 18 Feet

Drill Type: CME 75
Cased to Depth: N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger
Hammer Type: Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 4 inches			
		SM	Aggregate Base = 6 inches SAND, Silty; fine, moist, brown	DD = 85.9 pcf ø = 39.5° C = 0 psf	–	26
	2/6 2/6 3/6	SP	SAND; fine, loose, moist, light brown		5	15
5						
	5/6 8/6 4/6	SP	SAND, Poorly Graded; medium dense, medium fine, moist, light brown		12	27
10						
	2/6 1/6 2/6	ML	SILT, Clayey; soft, wet, gray		3	26
15						
	4/6 6/6 5/6		Trace of fine sand		11	33
20						
	1/6 4/6 5/6	SM	SAND, Silty; fine, loose, wet, dark gray	-200 = 23.5%	9	31
25			Bottom of Boring at 25 feet			
30						

Notes:

Figure Number B-12

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-13

Project: Home Depot

Location: Huntington Beach, CA

Logged By: H. Elbadri

Drilled By: T. Conley

Drill Type: CME 75

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02

Date: 11/05/04

Elevation: N/A

Depth to Groundwater: 18 Feet

Cased to Depth: N/A

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 5 inches			
	3/6 3/6 4/6	ML	Aggregate Base = 6 inches SILT, Sandy; medium, firm, moist, dark-gray		7	24
				DD = 99.2 pcf	--	37
5	3/6 4/6 7/6	CL	LEAN CLAY, Silty; stiff, moist, light brown		11	33
10	2/6 2/6 4/6		Becomes more silty		6	30
15	1/6 1/6 5/6				6	33
20	1/6 1/6 1/6		LEAN CLAY, Silty; very soft, wet, dark brown to dark gray		2	34
25	3/6 4/6 4/6	SM	SAND, fine, wet, loose, brown		8	34
			Bottom of Boring at 26.5 feet			
30						

Notes:

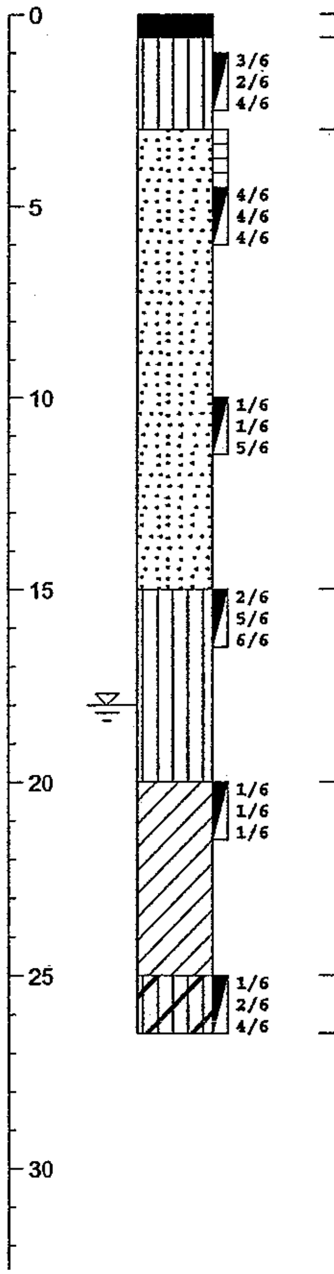
Figure Number B-13

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-14

Project: Home Depot
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 11/04/04
Logged By: H. Elbadri
Elevation: N/A
Drilled By: T. Conley
Depth to Groundwater: 18 Feet
Drill Type: CME 75
Cased to Depth: N/A
Auger Type: 6 5/8" O.D. Hollow Stem Auger
Hammer Type: Trip



ELEVATION/ DEPTH (feet)	USCS	Soil Description	Remarks	N-value	Moisture Content %
0	AC	Asphaltic Concrete = 3 inches			
	ML	Aggregate Base = 4 inches SILT, Sandy; medium loose, light brown		6	17
	SP	SAND, Poorly Graded; fine, loose, moist, light brown	DD = 98.3 pcf ø = 35.2° C = 0 psf	–	4
5				8	5
10				6	10
15	ML	SILT, Sandy; moist, stiff, dark gray		11	32
20	CL	CLAY, Silty; very soft, wet, dark gray		2	40
25	ML	SILT, Clayey; soft, wet, dark gray	-200 = 76% LL = 28 PI = 2	6	40
		Bottom of Boring at 26.5 feet			
30					

Notes:

THE TWINING LABORATORIES, INC. EST. 1898

SOIL TEST BORING SYMBOLIC LOG

BORING B-15

Project: Home Depot

Project Number: TL D05094.02

Location: Huntington Beach, CA

Date: 11/04/04

Logged By: H. Elbadri

Elevation: N/A

Drilled By: T. Conley

Depth to Groundwater: 16.5 Feet

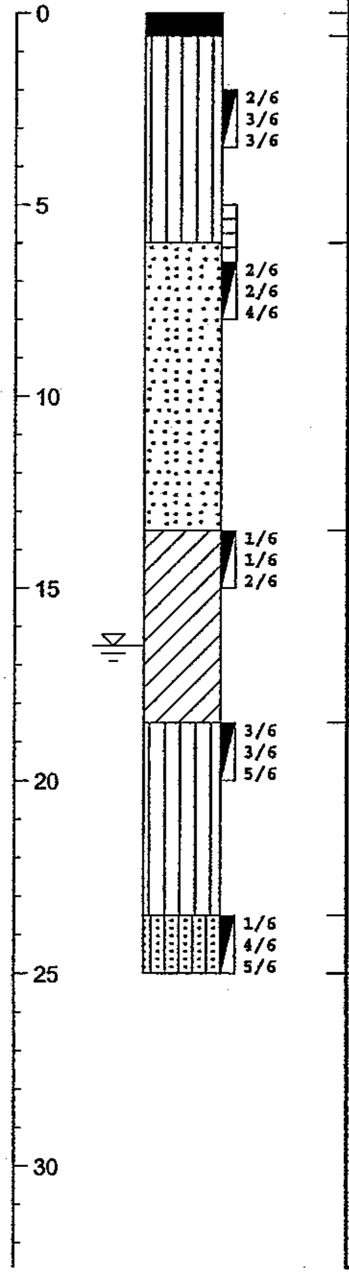
Drill Type: CME 75

Cased to Depth: N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 3.5 inches			
		ML	Aggregate BAse = 6 inches			
	2/6 3/6 3/6		SILT, Sandy; medium firm, moist, dark gray		6	19
5				DD = 95.7 pcf	--	5
	2/6 2/6 4/6	SP	SAND, Poorly Graded; fine, loose, light brown		6	22
10						
	1/6 1/6 2/6	CL	CLAY, Silty; soft, moist, dark gray		3	46
15						
	3/6 3/6 5/6	CL-ML	SILT, Sandy; Clayey, stiff, moist, dark gray	-200 = 74.1% LL = 26 PI = 6	8	32
20						
	1/6 4/6 5/6	SM	Sand, fine, silty, loose, wet, dark gray		9	34
25			Bottom of Boring at 25 feet			
30						



Notes:

Figure Number B-15

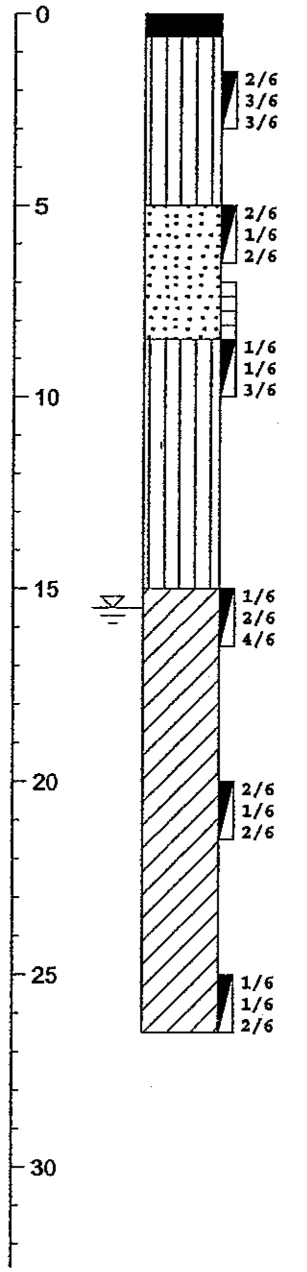
SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-16

Project: Home Depot	**Project Number: TL** D05094.02
Location: Huntington Beach, CA	**Date:** 11/04/04
Logged By: H. Elbadri	**Elevation:** N/A
Drilled By: T. Conley	**Depth to Groundwater:** 15.5 Feet
Drill Type: CME 75	**Cased to Depth:** N/A
Auger Type: 6 5/8" O.D. Hollow Stem Auger	**Hammer Type:** Trip

ELEVATION/ DEPTH (feet) / **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-value	Moisture Content %
AC	Asphaltic Concrete = 3 inches			
ML	Aggregate Base = 4 inches			
	SILT, Sandy; firm, moist, dark gray		6	19
SP	SAND, loose, fine to medium, moist, light brown		3	17
		DD = 92.2 psf	–	13
ML	SILT, soft, moist, light brown		4	31
CL	CLAY, Silty; soft, moist, dark gray, wet		6	33
	Same as above		3	42
			3	45
	Bottom of Boring at 26.5 feet			

Notes:

Figure Number B-16

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-17

Project: Home Depot

Project Number: TL D05094.02

Location: Huntington Beach, CA

Date: 11/04/04

Logged By: H. Elbadri

Elevation: N/A

Drilled By: T. Conley

Depth to Groundwater: N/E

Drill Type: CME 75

Cased to Depth: N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 3 inches			
		ML	Aggregate Base = 5 inches			
	4/6 4/6 5/6		SILT, Sandy; stiff, moist, brown		9	26
5	2/6 5/6 3/6	SP	SAND, Poorly Graded; fine to medium, loose, moist, light brown		8	4
	2/6 5/6 4/6				9	33
10		ML	SILT, Sandy; stiff, moist, brown			
			Bottom of Boring at 11.5 feet			
15						
20						
25						
30						

Notes:

Figure Number B-17

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-18

Project: Home Depot

Project Number: TL D05094.02

Location: Huntington Beach, CA

Date: 11/04/04

Logged By: H. Elbadri

Elevation: N/A

Drilled By: T. Conley

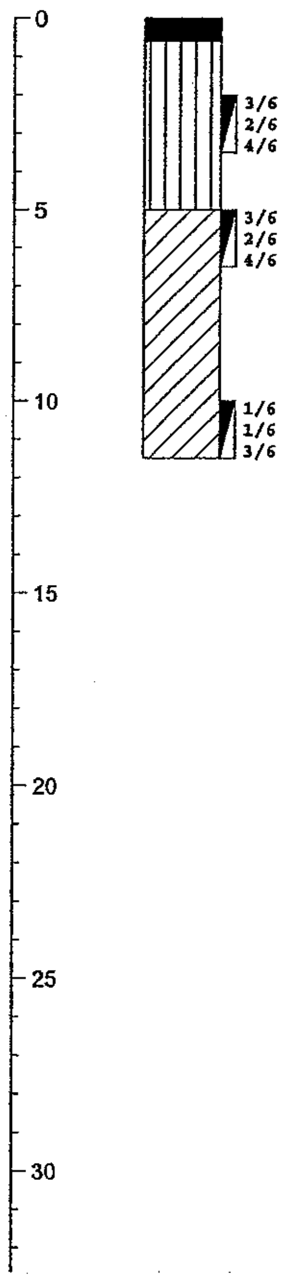
Depth to Groundwater: N/E

Drill Type: CME 75

Cased to Depth: N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Hammer Type: Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete - 4 inches			
		ML	Aggregate Base = 6 inches			
	3/6 2/6 4/6		SILT, with fine sand, medium firm, moist, brown		6	18
5	3/6 2/6 4/6	CL	CLAY, Silty; firm, moist, brown		6	32
10	1/6 1/6 3/6				4	18
			Bottom of Boring at 11.5 feet			

Notes:

Figure Number B-18

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-19

Project: Home Depot | **Project Number:** TL D05094.02

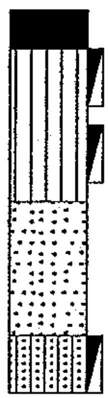
Location: Huntington Beach, CA | **Date:** 11/04/04

Logged By: H. Elbadri | **Elevation:** N/A

Drilled By: T. Conley | **Depth to Groundwater:** N/E

Drill Type: CME 75 | **Cased to Depth:** N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger | **Hammer Type:** Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 4 inches			
	4/6 4/6 4/6	ML	Aggregate Base = 6 inches SILT, Sandy; firm, moist, brown		8	18
	1/6 2/6 3/6				5	14
5		SP	SAND, Poorly Graded; loose, fine, moist, light brown			
	3/6 5/6 4/6	SM	SAND, Silty; loose, fine, light brown		9	21
10			Bottom of Boring at 10 feet			
15						
20						
25						
30						

Notes:

Figure Number B-19

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1899

BORING B-20

Project: Home Depot

Location: Huntington Beach, CA

Logged By: H. Elbadri

Drilled By: T. Conley

Drill Type: CME 75

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02

Date: 11/04/04

Elevation: N/A

Depth to Groundwater: N/E

Cased to Depth: N/A

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 3 inches			
		ML	Aggregate Base = 4 inches SILT, Sandy; loose, moist, dark gray			
	2/6 3/6 1/6				4	34
		CL	CLAY, soft, moist, brown			
5	1/6 2/6 2/6	SP-SM	SAND, silty; fine, loose, moist, brown		4	25
10	1/6 1/6 1/6	CL	CLAY, very soft, moist, dark brown		2	42
			Bottom of Boring at 11.5 feet			
15						
20						
25						
30						

Notes:

Figure Number B-20

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-21

Project: Home Depot
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 11/04/04
Logged By: H. Elbadri
Elevation: N/A
Drilled By: T. Conley
Depth to Groundwater: N/E
Drill Type: CME 75
Cased to Depth: N/A
Auger Type: 6 5/8" O.D. Hollow Stem Auger
Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 3 inches			
		ML	Aggregate Base = 3 inches			
	2/6 2/6 3/6		SILT, Clayey; moist, dark brown to black		5	11
		SP-SM	SAND, Silty; loose, moist, light brown			
5	1/6 4/6 3/6	ML	SILT, Sandy; firm, moist, trace of clay, light brown		7	28
10	1/6 1/6 2/6	CL	CLAY, soft, moist, dark gray, medium plasticity		3	39
			Bottom of Boring at 11.5 feet			
15						
20						
25						
30						

Notes:

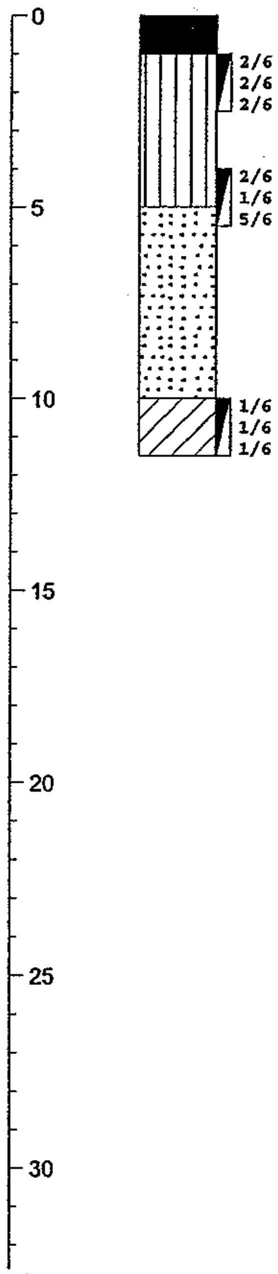
Figure Number B-21

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-22

Project: Home Depot
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 11/04/04
Logged By: H. Elbadri
Elevation: N/A
Drilled By: T. Conley
Depth to Groundwater: N/E
Drill Type: CME 75
Cased to Depth: N/A
Auger Type: 6 5/8" O.D. Hollow Stem Auger
Hammer Type: Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 2.5 inches			
	2/6, 2/6, 2/6	ML	Aggregate Base = 5 inches SILT, Sandy, Clayey; soft, moist, brown		4	23
5	2/6, 1/6, 5/6	SP	SAND, Poorly Graded; fine, loose, moist, wet, brown		6	9
10	1/6, 1/6, 1/6	CL	CLAY, very soft, moist, dark brown		2	44
			Bottom of Boring at 11.5 feet			

Notes:

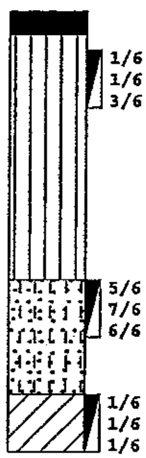
Figure Number B-22

SOIL TEST BORING SYMBOLIC LOG

THE TWINING LABORATORIES, INC. EST. 1898

BORING B-23

Project: Home Depot
Project Number: TL D05094.02
Location: Huntington Beach, CA
Date: 11/04/04
Logged By: H. Elbadri
Elevation: N/A
Drilled By: T. Conley
Depth to Groundwater: N/E
Drill Type: CME 75
Cased to Depth: N/A
Auger Type: 6 5/8" O.D. Hollow Stem Auger
Hammer Type: Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 3 inches			
	1/6 1/6 3/6	ML	Aggregate Base = 4 inches SILT, Sandy; soft, moist, with clay, dark brown to black		4	42
5						
	5/6 7/6 6/6	SP-SM	SAND, Silty; moist, fine, medium dense, light brown		13	18
10	1/6 1/6 1/6	CL	CLAY, Silty; very soft, moist, dark brown to black		2	43
			Bottom of Boring at 11.5 feet			
15						
20						
25						
30						

Notes:

Figure Number B-23

THE TWINING LABORATORIES, INC. EST. 1898

SOIL TEST BORING SYMBOLIC LOG

BORING B-24

Project: Home Depot

Project Number: TL D05094.02

Location: Huntington Beach, CA

Date: 11/04/04

Logged By: H. Elbadri

Elevation: N/A

Drilled By: T. Conley

Depth to Groundwater: 5 Feet

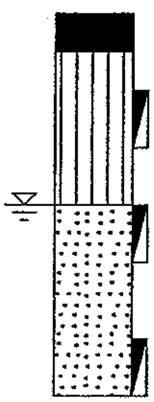
Drill Type: CME 75

Cased to Depth: N/A

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 3 inches			
	2/6 1/6 2/6	ML	Aggregate Base = 5 inches SILT, Clayey: moist, dark gray to black Silt, soft, moist, trace of clay, brown		3	21
5	4/6 4/6 4/6	SP	SAND, fine, loose, moist, light brown		8	7
	2/6 1/6 2/6		Same as above		3	29
10			Bottom of Boring at 10 feet			
15						
20						
25						
30						



Notes:

Figure Number B-24

THE TWINING LABORATORIES, INC. EST. 1898

SOIL TEST BORING SYMBOLIC LOG

BORING B-25

Project: Home Depot

Location: Huntington Beach, CA

Logged By: H. Elbadri

Drilled By: T. Conley

Drill Type: CME 75

Auger Type: 6 5/8" O.D. Hollow Stem Auger

Project Number: TL D05094.02

Date: 11/05/04

Elevation: N/A

Depth to Groundwater: N/E

Cased to Depth: N/A

Hammer Type: Trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-value	Moisture Content %
0		AC	Asphaltic Concrete = 2.5 inches			
		ML	Aggregate Base = 4 inches			
	1/6 1/6 2/6		SILT, Clayey; moist, dark brown to black, soft		3	25
5	1/6 3/6 5/6	SP	SAND, Poorly Graded; fine, loose, moist, light brown		8	7
	1/6 2/6 3/6				5	21
10			Bottom of Boring at 10 feet			
15						
20						
25						
30						

Notes:

KEY TO SYMBOLS

Symbol	Description

Strata symbols

Asphaltic Concrete

SILT, Sandy (ML)

SAND, Poorly Graded (SP)

SAND, Poorly Graded with Silt (SP-SM)

SAND, Silty (SM)

LEAN CLAY (CL)

Silty low plasticity clay

Portland Concrete Cement

Misc. Symbols

Water table during drilling

Boring continues

Soil Samplers

California Modified split barrel ring sampler

Standard penetration test

Notes:

1. Test borings were drilled on 02/09/04 and 02/11/04 using a CME 75 equipped with Hollow Stem Auger.

2. Groundwater was encountered during excavation of the test borings.

3. Test boring locations were located by measuring wheel with reference to the existing site features.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs. Abbreviations used are:

DD =	Natural dry density	LL =	Liquid limit (%)
UC =	Unconfined compression (psf)	PI =	Plasticity index (%)
-4 =	Percent passing #4 sieve (%)	pH =	Soil pH
-200 =	Percent passing #200 sieve (%)	SS =	Soluble sulfates (%)
SR =	Soil resistivity (ohm-cm)	Cl =	Soluble chlorides (%)
c =	Cohesion (psf)	ø =	Angle of internal friction (degrees)
TS =	Field Torvane Shear Strength test (tsf)	N/A =	Not applicable
		N/E =	None encountered

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Portland Cement Concrete
	SAND, Silty (SM)
	SAND, Poorly Graded (SP)
	LEAN CLAY (CL)
	SILT, Sandy (ML)
	SAND, Clayey (SC)
	Asphaltic Concrete

Symbol	Description
Misc. Symbols	
	Water table during drilling
	Boring continues
Soil Samplers	
	California Modified split barrel ring sampler
	Standard penetration test

Notes:

1. Test borings were drilled on 06/17/04 using a Beaver Tri-Pod equipped with a 6" Solid Flight Auger and a CME 75 equipped with 6 5/8" Hollow Stem Auger.

2. Groundwater was encountered during excavation of the test borings.

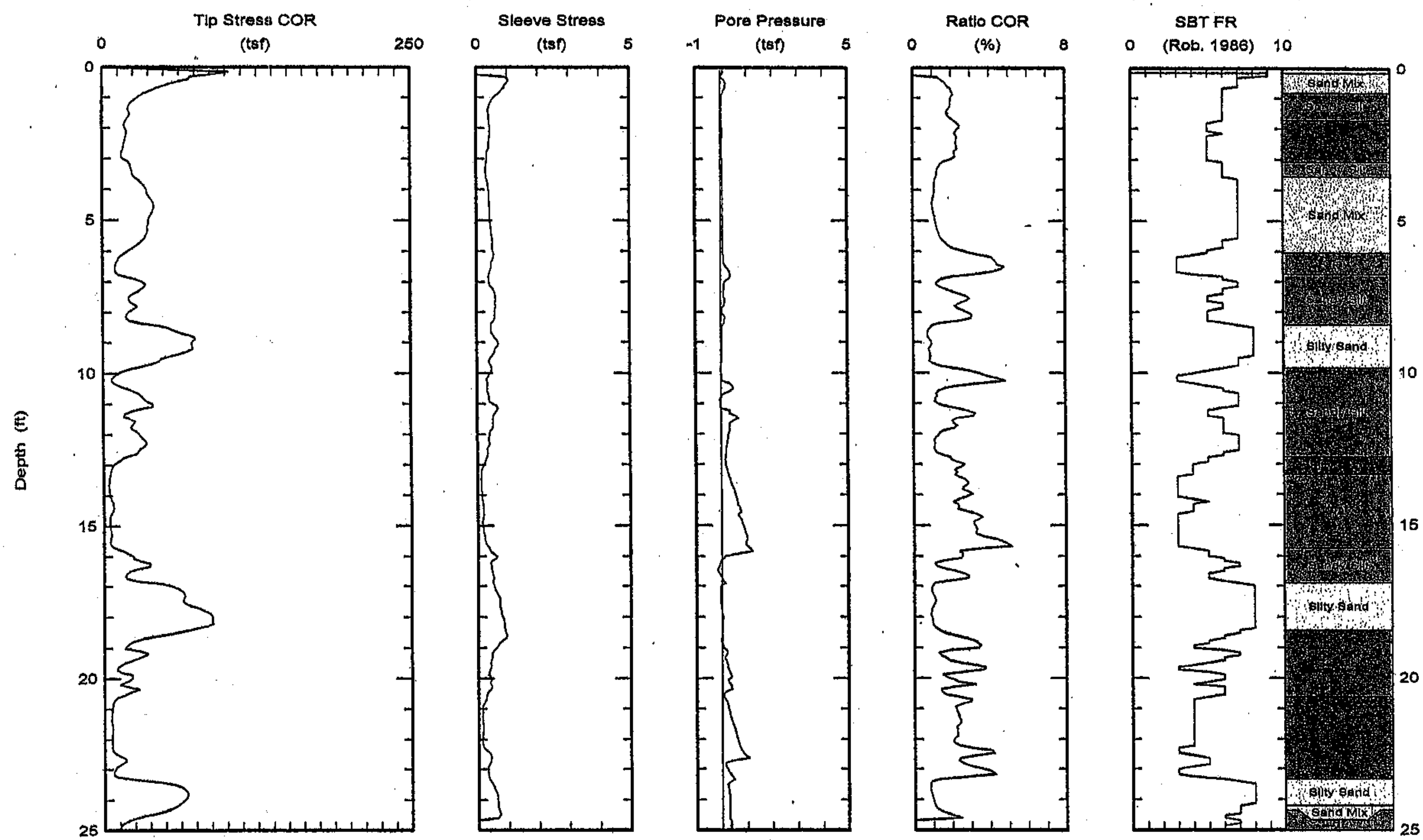
3. Test boring locations were located by measuring wheel with reference to the existing site features.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs. Abbreviations used are:

DD =	Natural dry density	LL =	Liquid limit (%)
UC =	Unconfined compression (psf)	PI =	Plasticity index (%)
-4 =	Percent passing #4 sieve (%)	pH =	Soil pH
-200 =	Percent passing #200 sieve (%)	SS =	Soluble sulfates (%)
SR =	Soil resistivity (ohm-cm)	Cl =	Soluble chlorides (%)
c =	Cohesion (psf)	ø =	Angle of internal friction (degrees)
TS =	Field Torvane Shear Strength test (tsf)	N/A =	Not applicable
		N/E =	None encountered

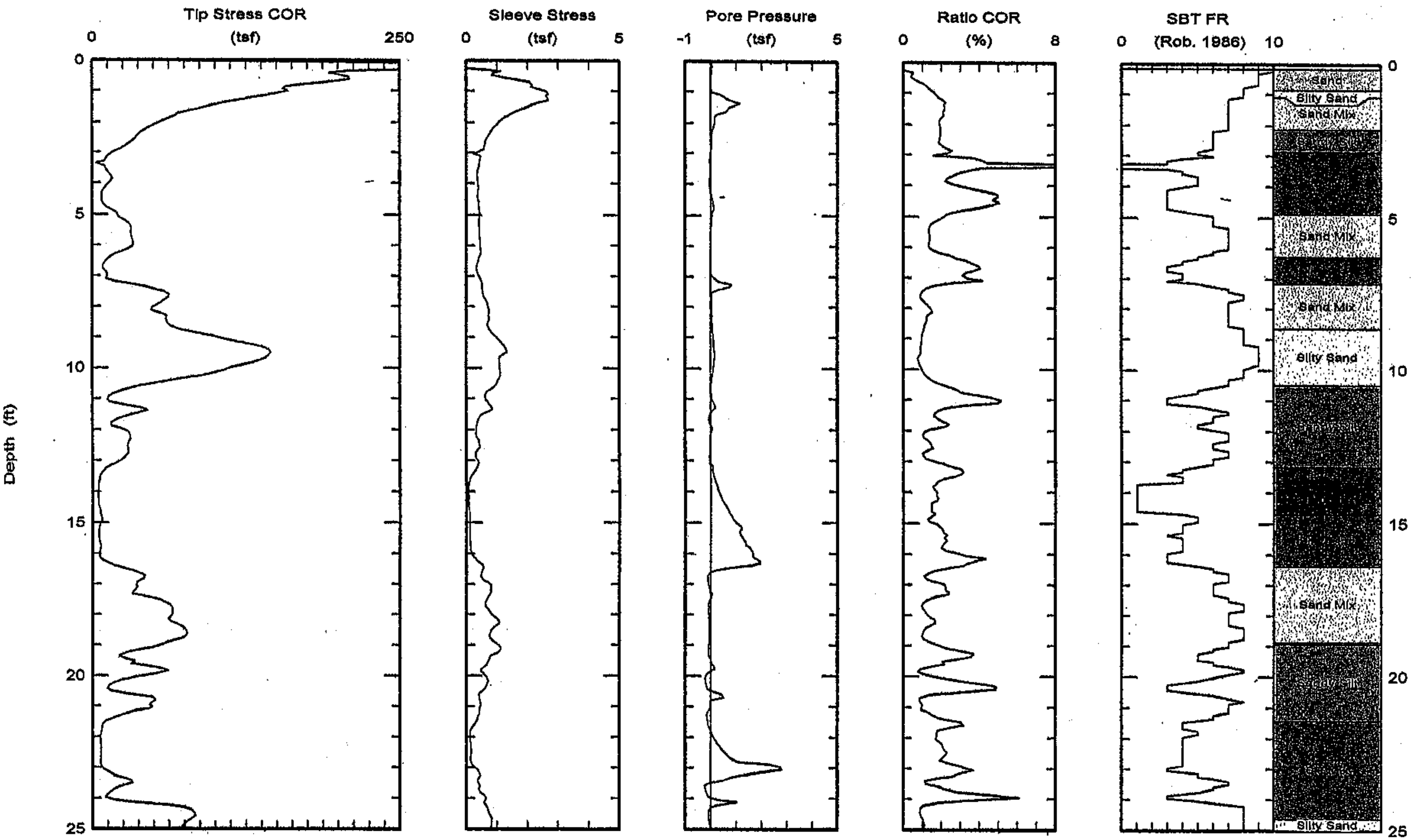
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 16/Jun/2004 Test ID: CPT-1 Project: D05094
	Client: Twining Laboratory Job Site: Home Depot / Huntington Beach	



Maximum depth: 25.01 (ft)
Page 1 of 2

Test ID: CPT-1
File: C16U0412C.ECP

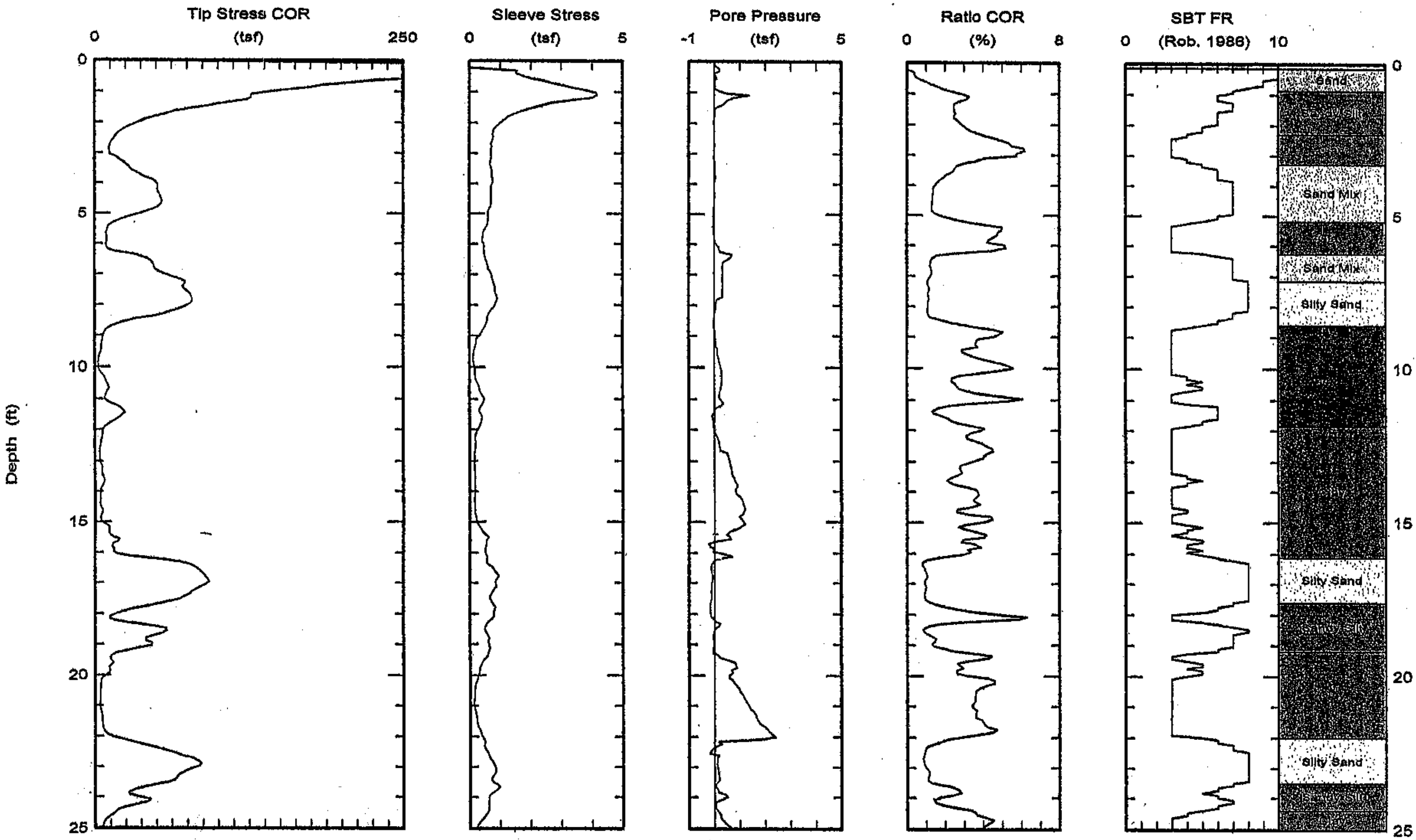
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 16/Jun/2004 Test ID: CPT-2 Project: D05094
	Client: Twining Laboratory Job Site: Home Depot / Huntington Beach	



Maximum depth: 25.36 (ft)

Test ID: CPT-2
File: C16U0411C.ECP

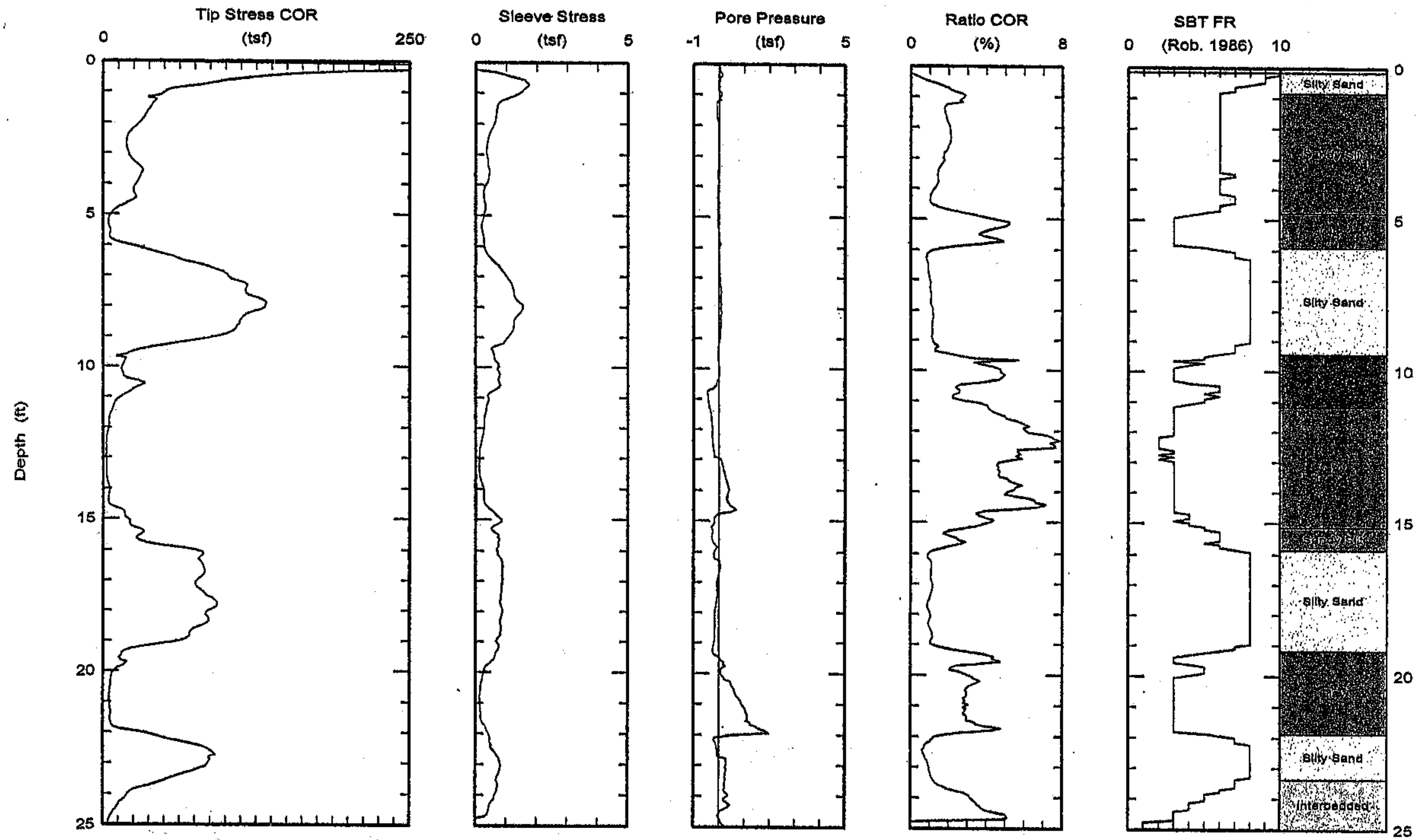
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 16/Jun/2004 Test ID: CPT-3 Project: D05094
	Client: Twining Laboratory Job Site: Home Depot / Huntington Beach	



Maximum depth: 28.15 (ft)
Page 1 of 2

Test ID: CPT-3
File: C16U0410C.ECP

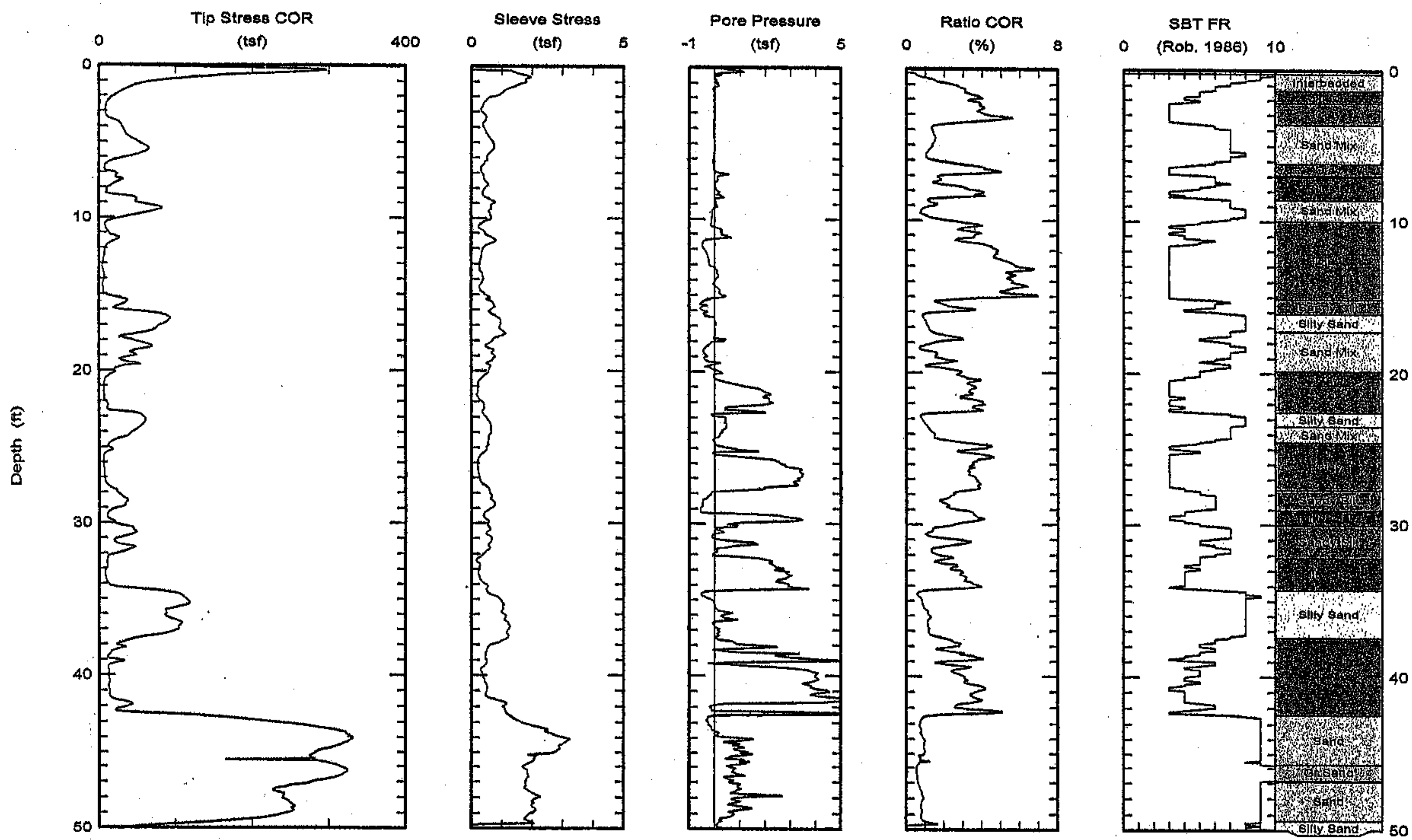
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 16/Jun/2004 Test ID: CPT-4 Project: D05094
	Client: Twining Laboratory Job Site: Home Depot / Huntington Beach	



Maximum depth: 25.11 (ft)
Page 1 of 2

Test ID: CPT-4
File: C16U0409C.ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 16/Jun/2004 Test ID: CPT-5 Project: D05094
	Client: Twining Laboratory Job Site: Home Depot / Huntington Beach	



Maximum depth: 50.07 (ft)

Page 1 of 2

Test ID: CPT-5

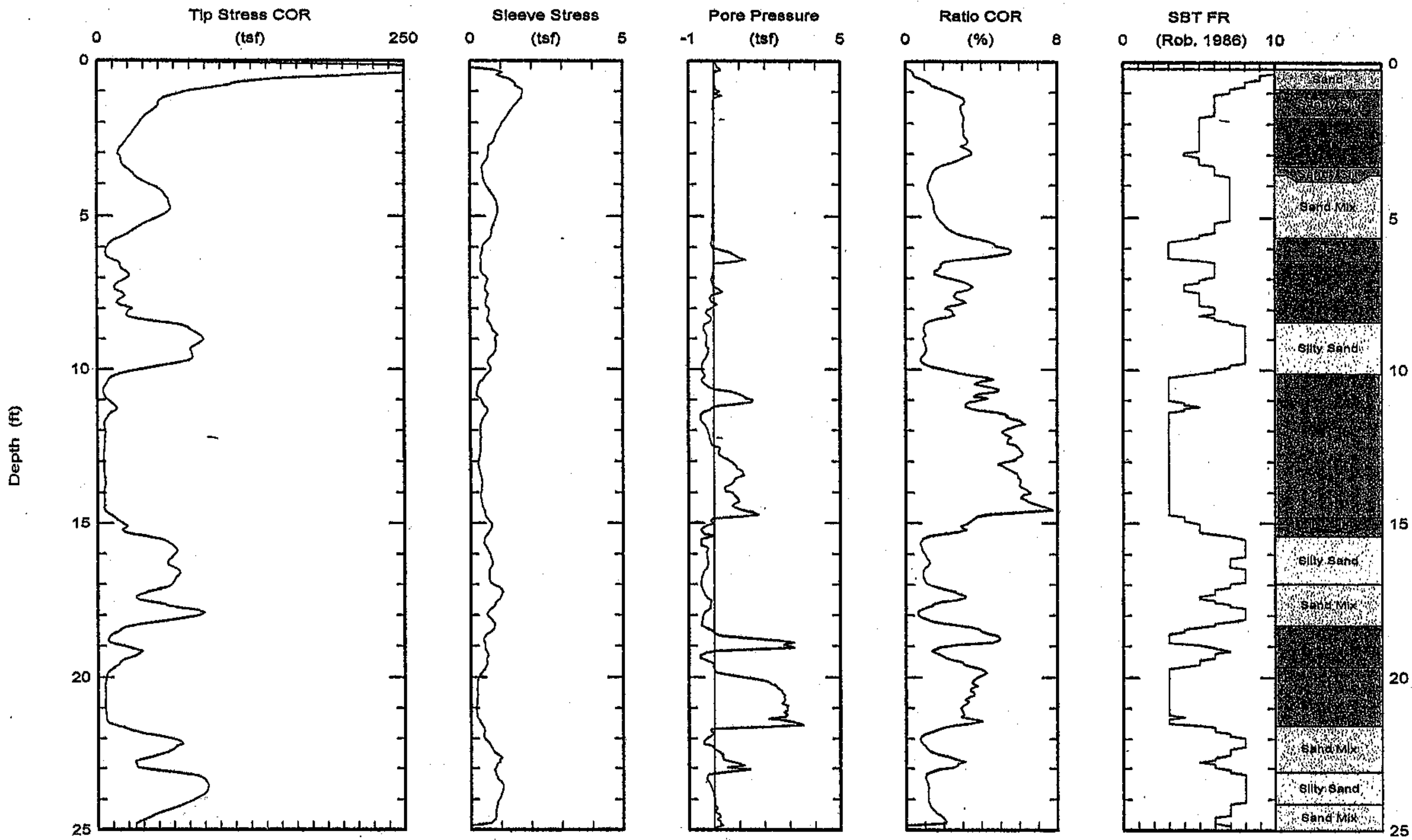
File: C16U0408C.ECP

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 16/Jun/2004
Test ID: CPT-6
Project: D05094

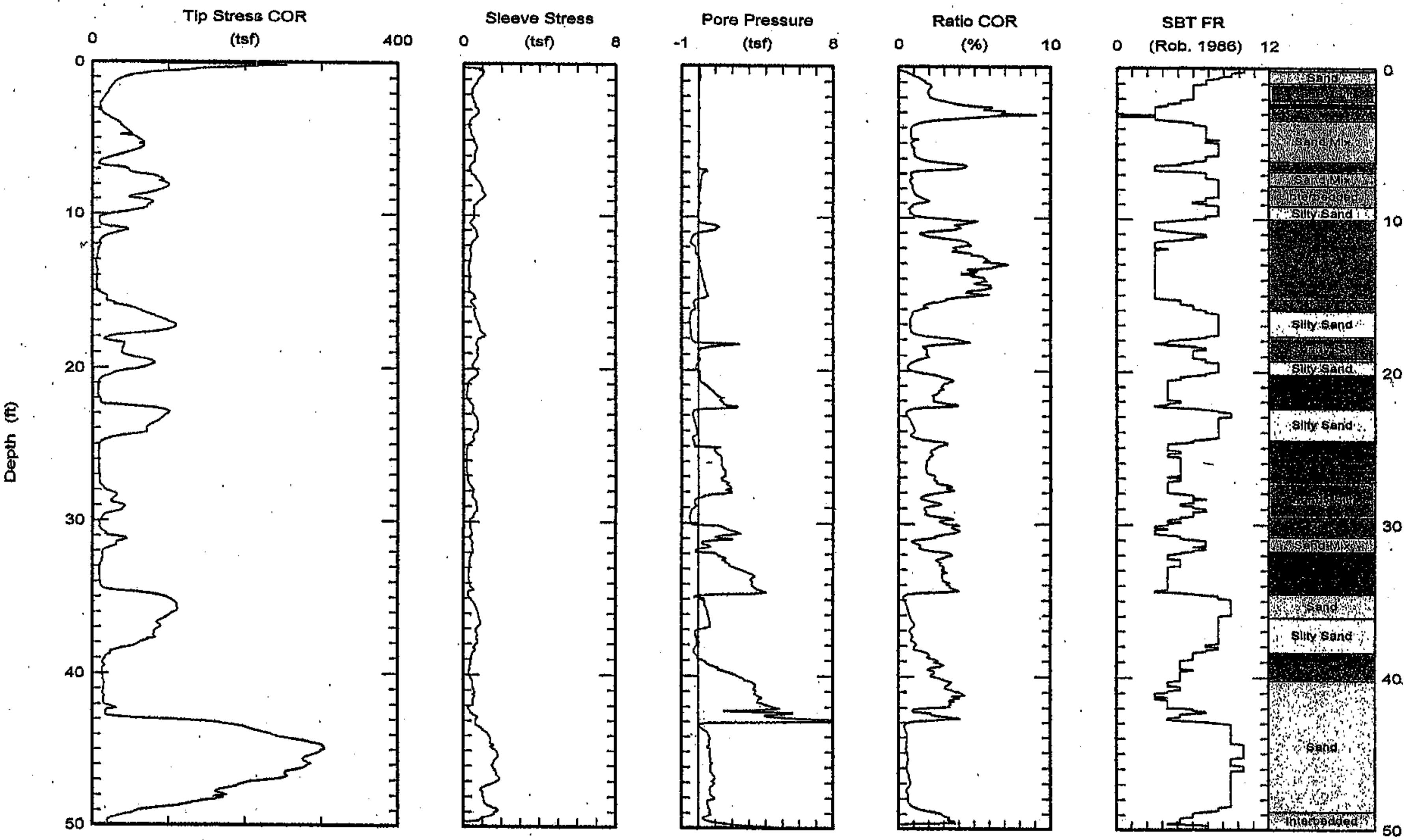
Client: Twining Laboratory
Job Site: Home Depot / Huntington Beach



Maximum depth: 25.14 (ft)
Page 1 of 2

Test ID: CPT-6
File: C16U0407C.ECP

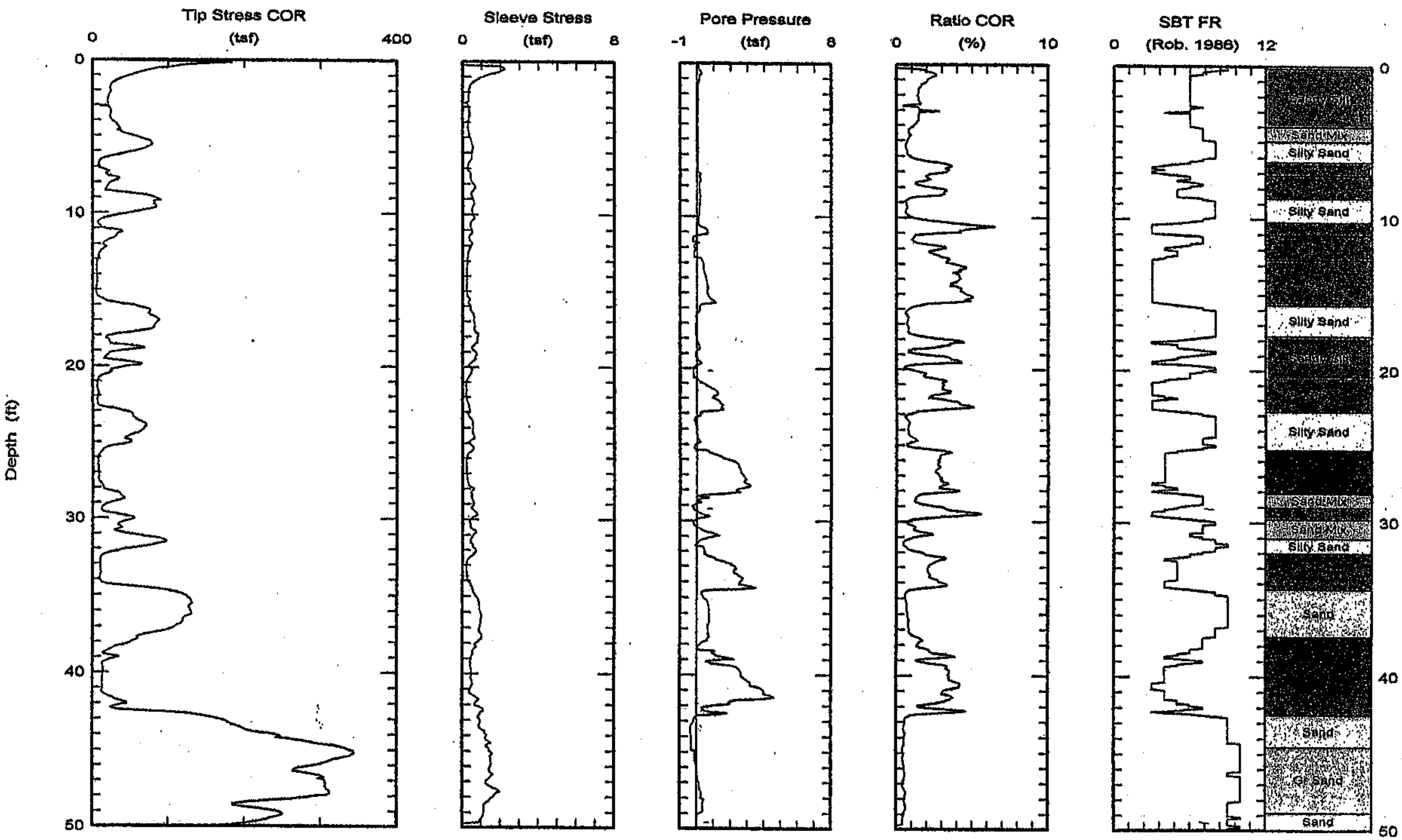
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2004 Test ID: CPT-1A Project: HuntingtonBeach
	Client: Twining Labortory Job Site: Home Depot	



Maximum depth: 49.96 (ft)

Test ID: CPT-1

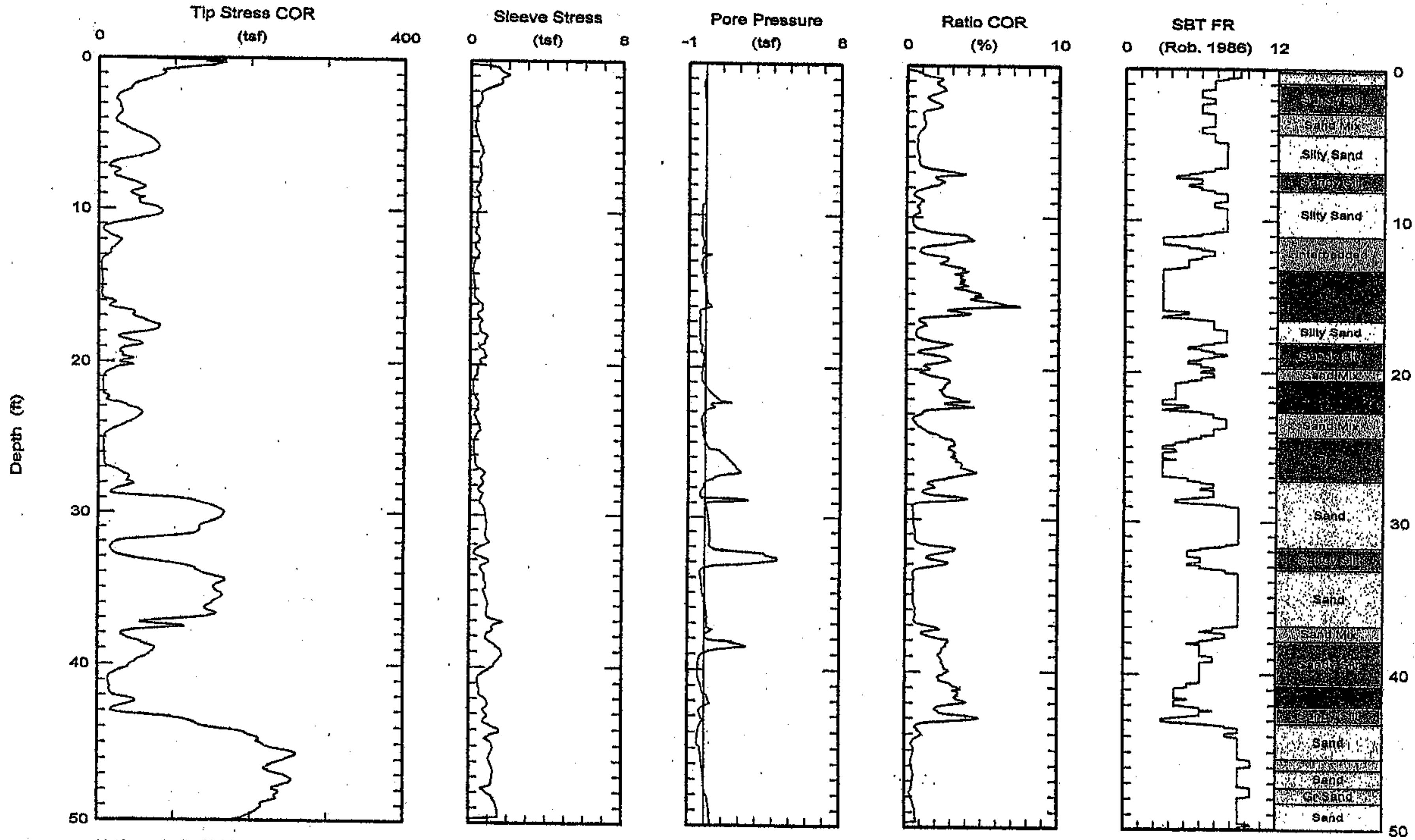
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2004 Test ID: CPT-2A Project: HuntingtonBeach
	Client: Twining Labortory Job Site: Home Depot	



Maximum depth: 50.06 (ft)
Page 1 of 2

Test ID: CPT-2

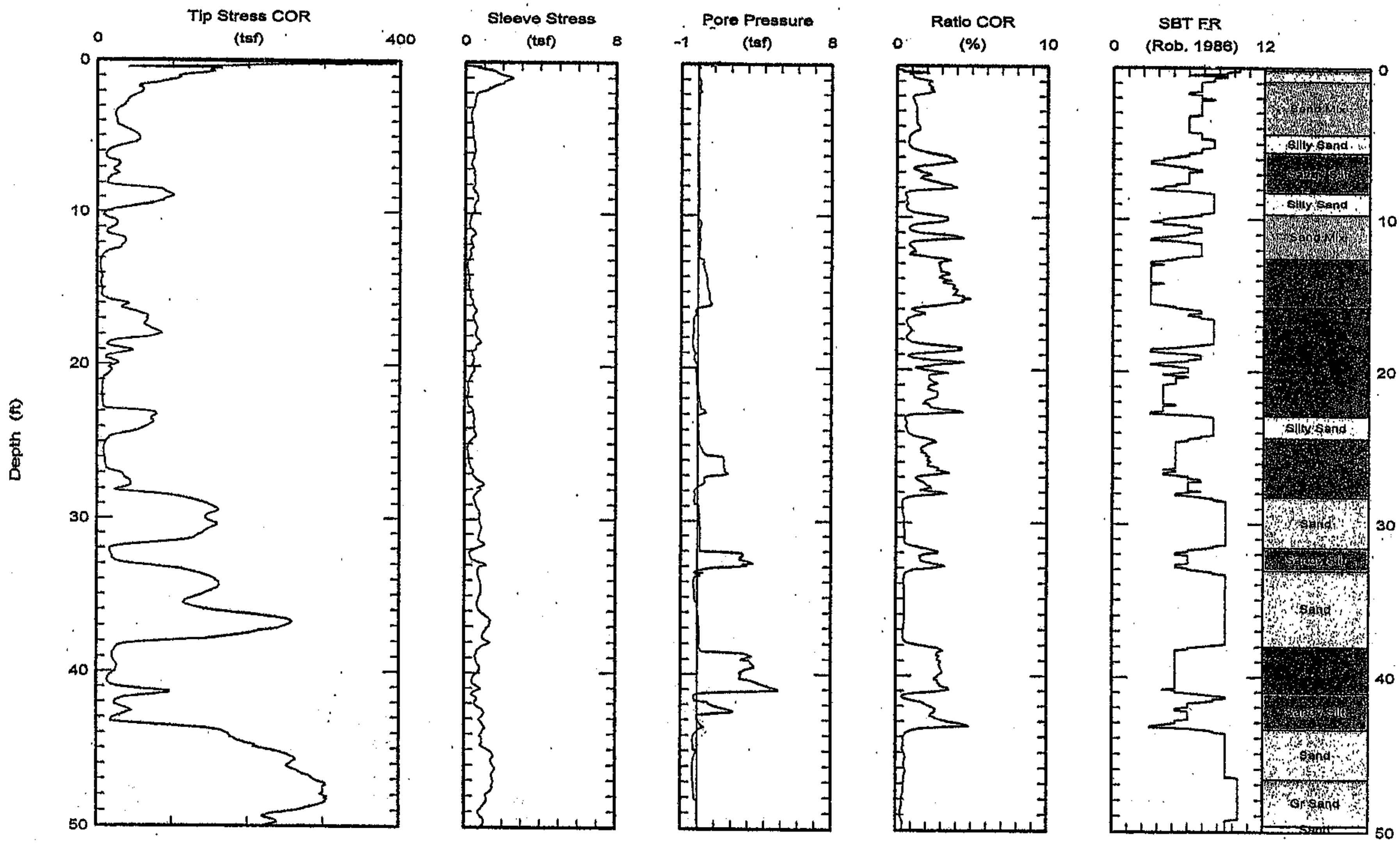
Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2004 Test ID: CPT-3A Project: HuntingtonBeach
	Client: Twining Labortory Job Site: Home Depot	



Maximum depth: 50.02 (ft)
Page 1 of 2

Test ID: CPT-3
File: 712N0406C.ECP

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2004 Test ID: CPT-4A Project: HuntingtonBeach
	Client: Twining Labortory Job Site: Home Depot	

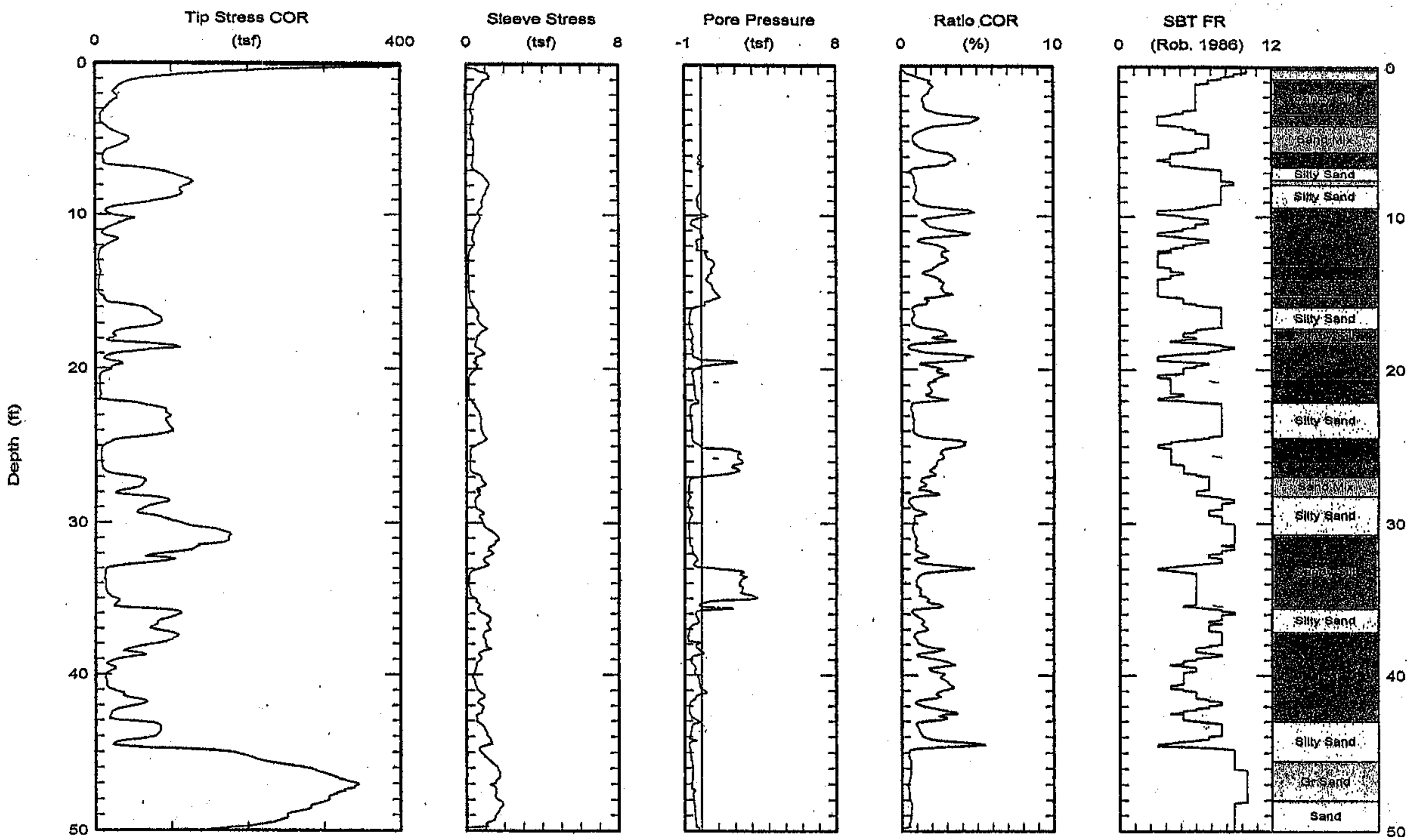


Maximum depth: 50.40 (ft)

Page 1 of 2

Test ID: CPT-4

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2004 Test ID: CPT-5A Project: HuntingtonBeach
	Client: Twining Labortory Job Site. Home Depot	

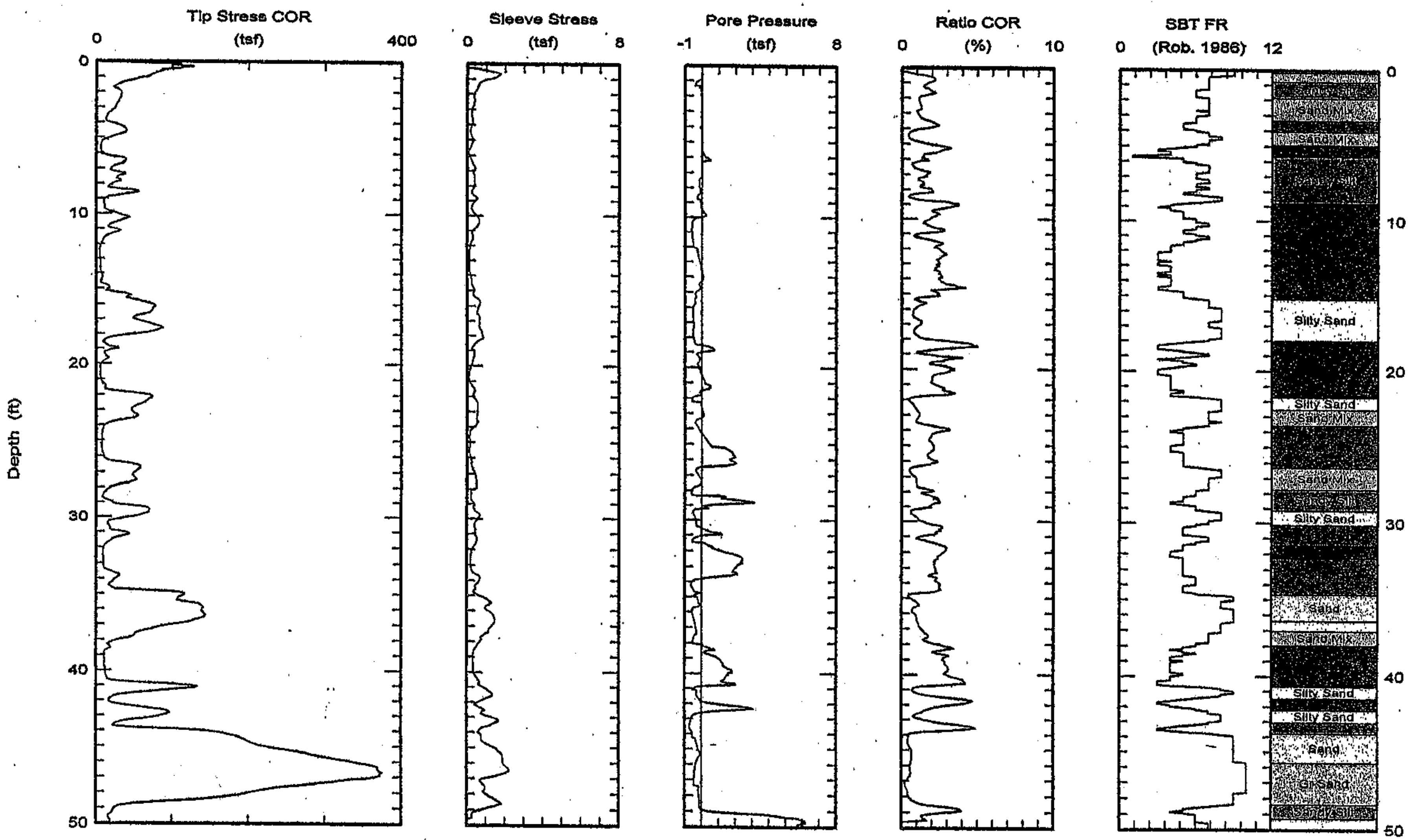


Maximum depth: 50.09 (ft)

Page 1 of 2

Test ID: CPT-5

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 skehoe@msn.com	CPT Data 30 ton rig	Date: 12/Nov/2004 Test ID: CPT-6A Project: HuntingtonBeach
	Client: Twining Labortory Job Site Home Depot	



Maximum depth: 49.96 (ft)

Test ID: CPT-6

APPENDIX C

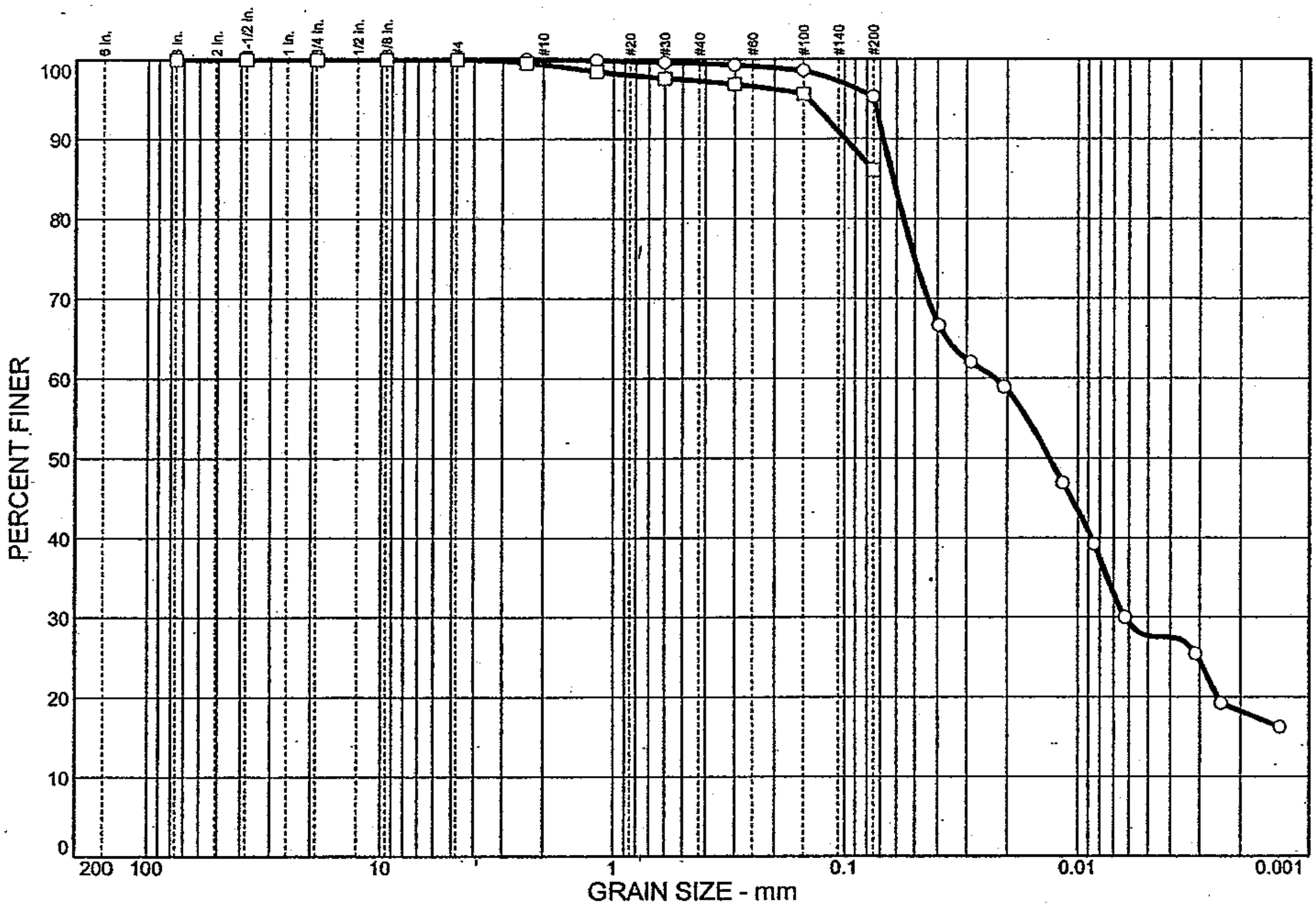
APPENDIX C

RESULTS OF LABORATORY TESTS

This appendix contains the individual results of the following tests. The results of the moisture content and dry density tests are included on the test boring logs in Appendix B. These data, along with the field observations, were used to prepare the final test boring logs in Appendix B.

These Included:	Number of Tests:	To Determine:
Natural Moisture (ASTM D2216)	97	Moisture contents representative of field conditions at the time the sample was taken.
Natural Density (ASTM D2216)	16	Dry unit weight of sample representative of in-situ or in-place undisturbed condition.
Grain-Size Distribution (ASTM D422)	11	Size and distribution of soil particles, i.e., clay, silt, sand, and gravel.
Atterberg Limits (ASTM D4318)	3	The consistency and "stickiness," as well as the range of moisture contents within which the material is "workable."
Direct Shear (ASTM D3080)	3	Soil shearing strength under varying loads and/or moisture conditions.
Consolidation (ASTM D2435)	6	The amount and rate at which a soil sample compresses when loaded, and the influence of saturation on its behavior.
Expansion Index (UBC 29-2)	1	Swell potential of soil with increases in moisture content.

These Included:	Number of Tests:	To Determine:
Moisture-Density Relationship (ASTM D1557)	1	The optimum (best) moisture content for compacting soil and the maximum dry unit weight (density) for a given compactive effort.
R-Value (ASTM D2844)	6	The capacity of a subgrade or subbase to support a pavement section designed to carry a specified traffic load.
Sulfate Content (ASTM D4327)	2	Percentage of water-soluble sulfate as (SO4) in soil samples. Used as an indication of the relative degree of sulfate attack on concrete and for selecting the cement type.
Chloride Content (ASTM D4327)	2	Percentage of soluble chloride in soil. Used to evaluate the potential attack on encased reinforcing steel.
Resistivity (ASTM D1125)	2	The potential of the soil to corrode metal.
pH (ASTM D4972)	2	The acidity or alkalinity of subgrade material.



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.5	4.2	67.6	27.7
□	0.0	0.0	0.0	0.6	2.1	11.2	86.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	B-6		23.5		ML
□	B-4		1.5		ML

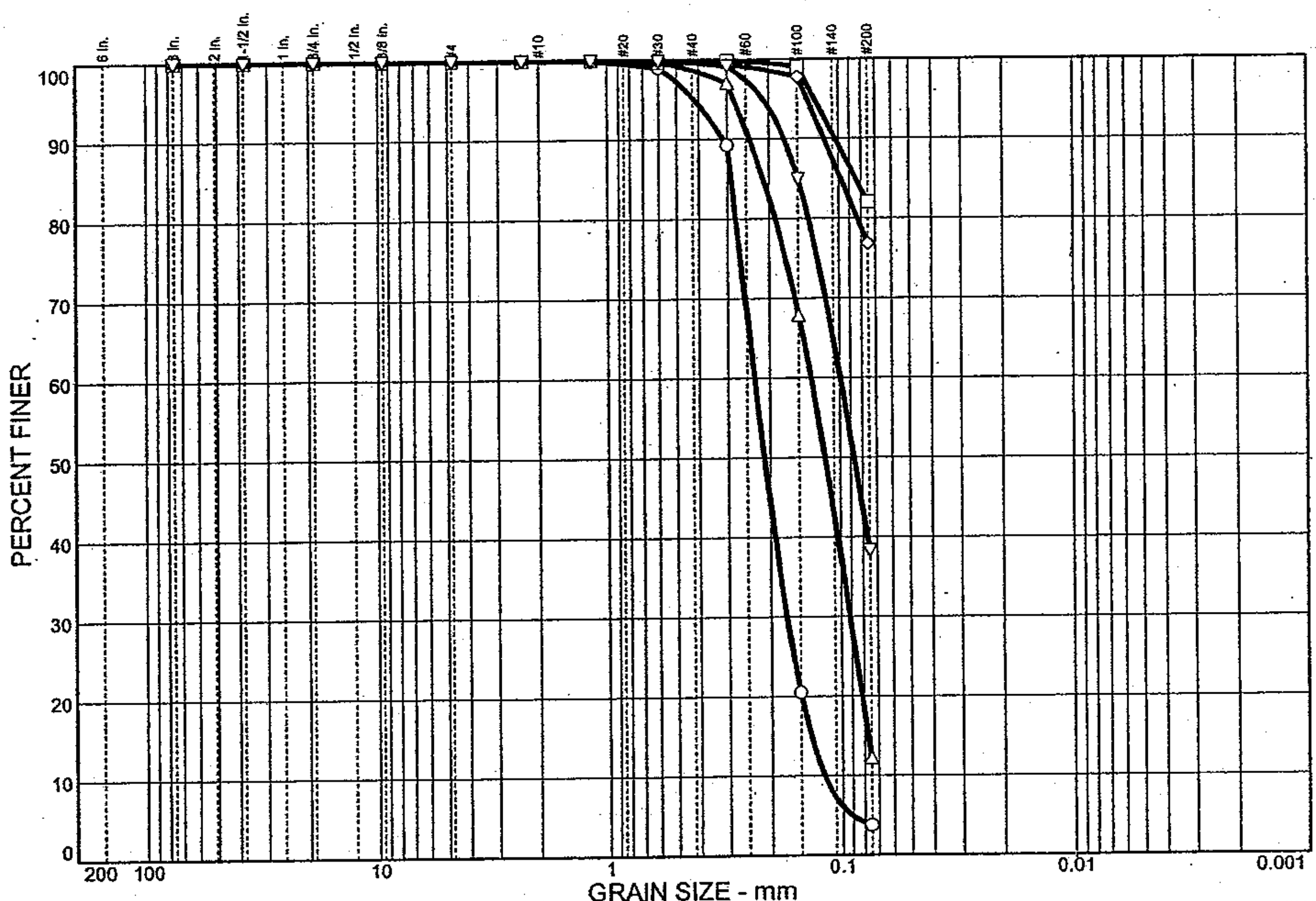
THE TWINING LABORATORIES, INC.

Client:

Project: Home Depot Remodel

Project No.: D05094.01

Figure No. 1

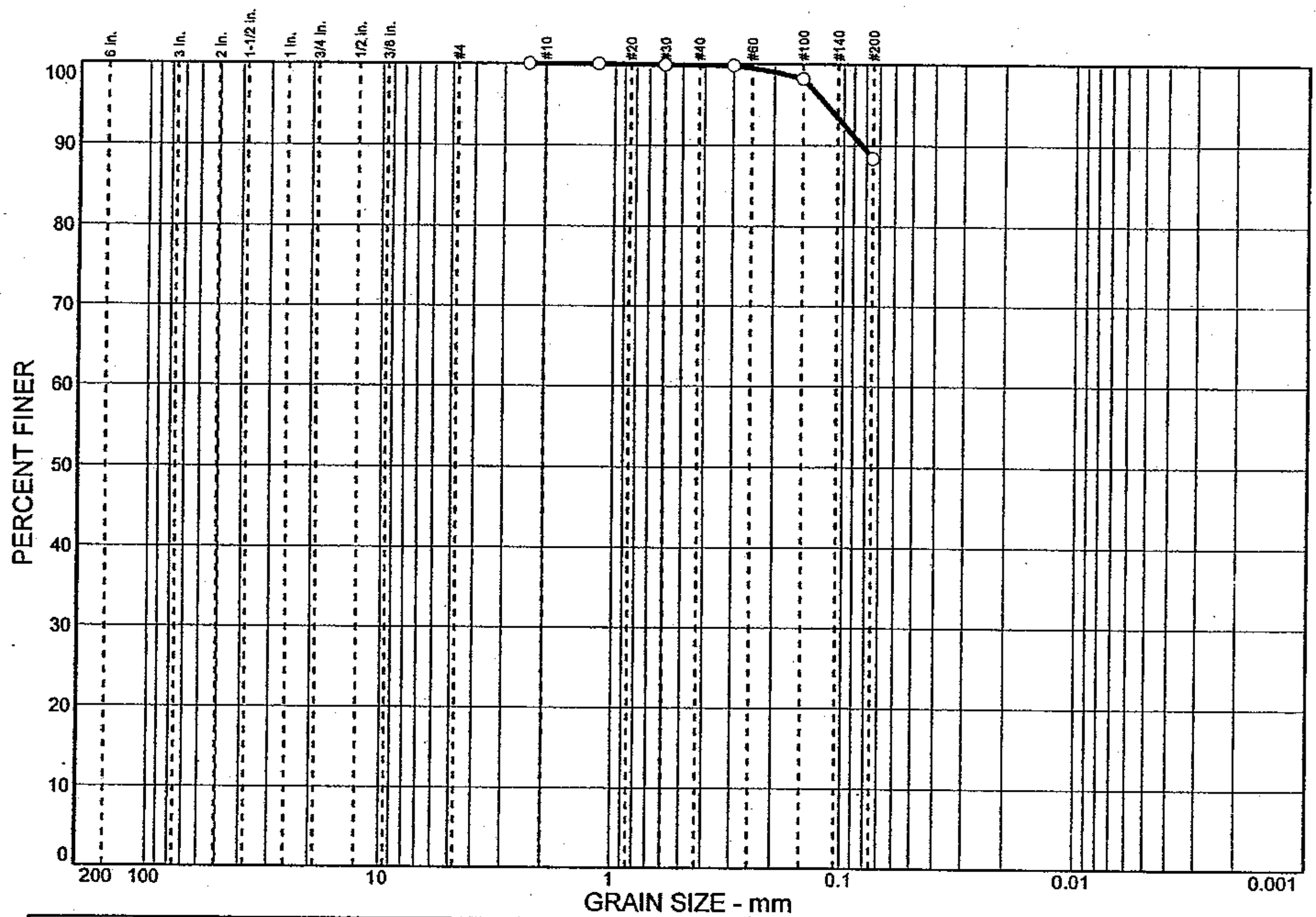


	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	4.7	91.6	3.7	
□	0.0	0.0	0.0	0.0	0.1	17.9	82.0	
△	0.0	0.0	0.0	0.0	1.3	86.5	12.2	
◇	0.0	0.0	0.0	0.0	0.3	22.9	76.8	
▽	0.0	0.0	0.0	0.0	0.4	61.3	38.3	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	B-2		5	Medium dense, light brown	SP
□	B-5		15		ML
△	B-7		3.5		SM
◇	B-8		1.5	At 1.5 Feet - No organic smell	ML
▽	B-8		23	SAND, Silty; loose, wet, fine, grayish blue	SM

THE TWINING LABORATORIES, INC.	**Client:** **Project:** Home Depot Remodel **Project No.:** D05094.01 **Figure No.** 2



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.2	11.4	88.4	

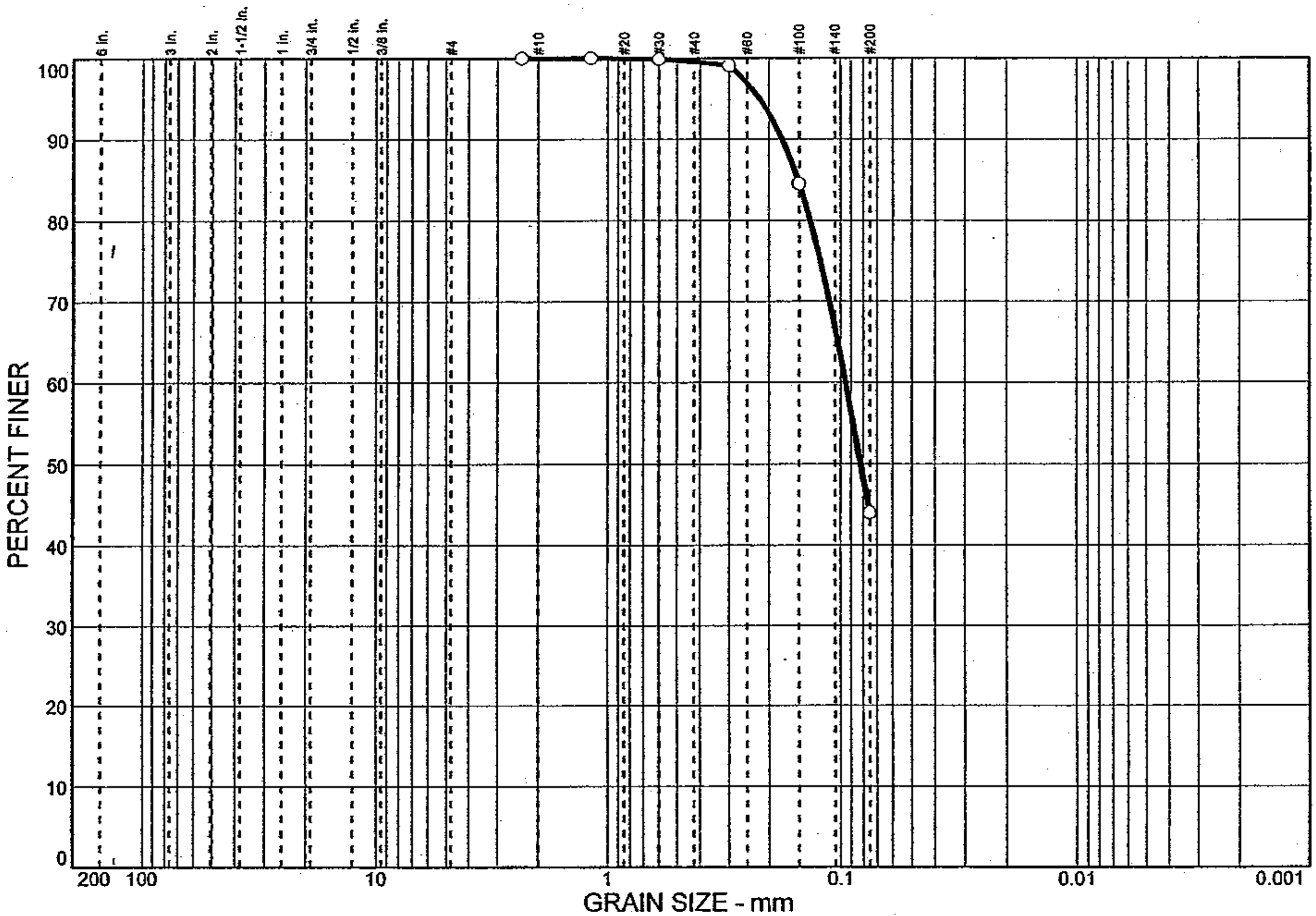
SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	B-11		20	SILT, Sandy, Poorly Graded; fine, loose, wet, dark brown	

THE TWINING LABORATORIES, INC.

Client: Home Depot USA, Inc.
Project: Home Depot

Project No.: D05094.02

Figure No. 3

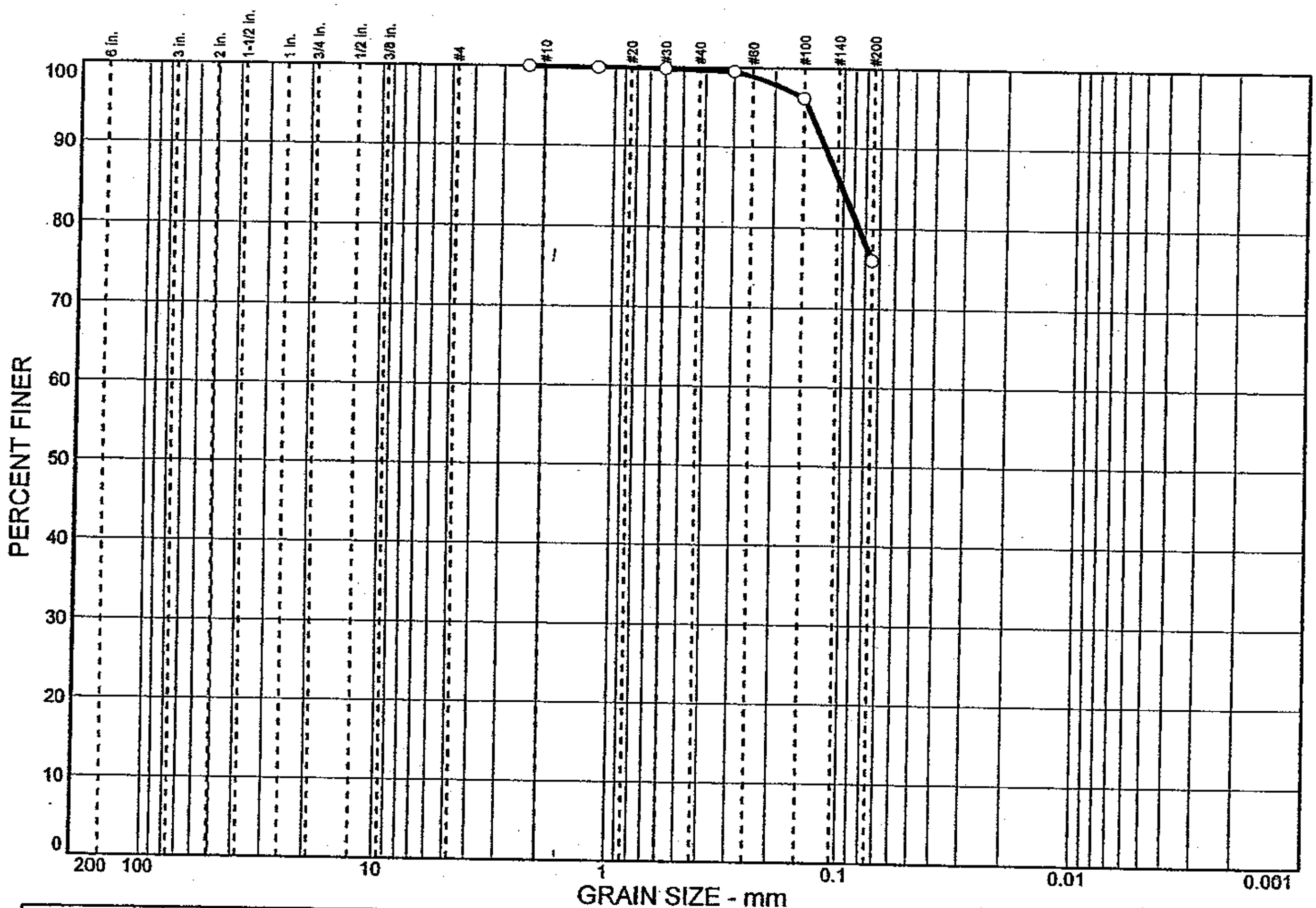


	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.4	55.6	44.0	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	B-12		23.5	SAND, Silty; fine, loose, wet, dark gray	SM

THE TWINING LABORATORIES, INC.	**Client:** Home Depot USA, Inc. **Project:** Home Depot **Project No.:** D05094.02 **Figure No.** 4



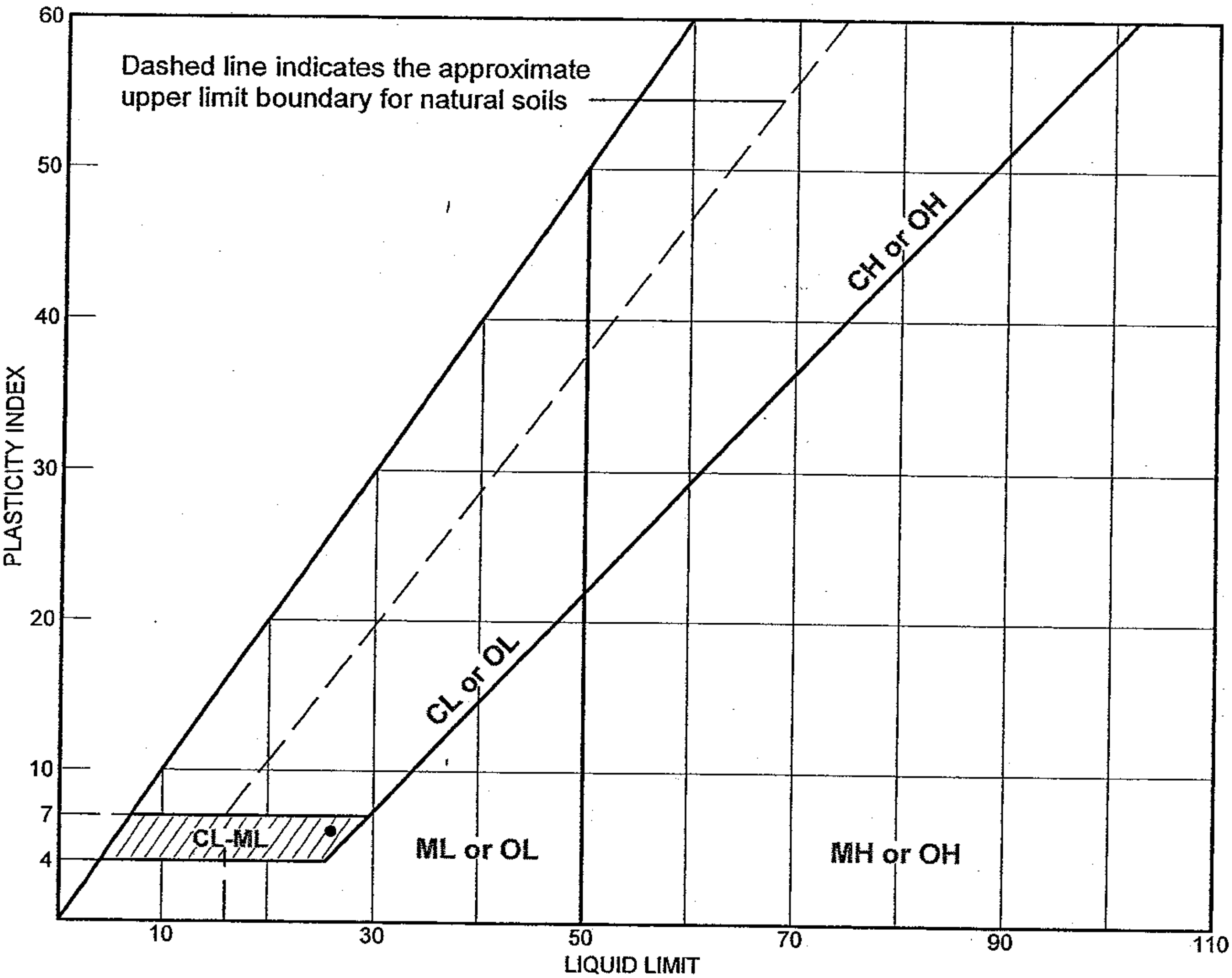
	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.3	23.7	76.0	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	B-14		25	SILT, Clayey; soft, wet, dark gray	ML

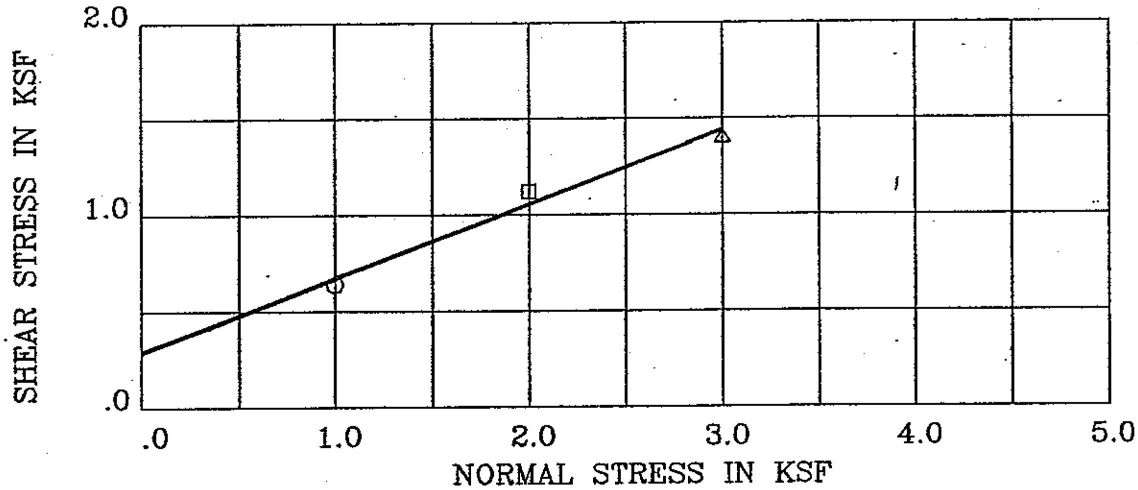
THE TWINING LABORATORIES, INC.	**Client:** Home Depot USA, Inc. **Project:** Home Depot **Project No.:** D05094.02 **Figure No.** 5

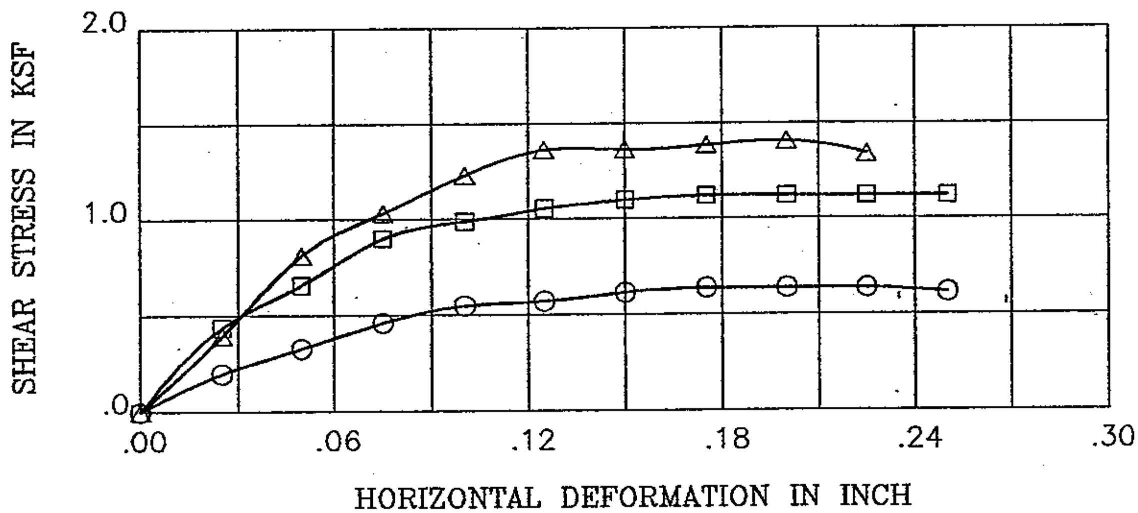
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-15		18.5	32	20	26	6	CL-ML

LIQUID AND PLASTIC LIMITS TEST REPORT THE TWINING LABORATORIES, INC.	**Client:** Home Depot USA, Inc. **Project:** Home Depot **Project No.:** D05094.02 **Figure No.** 9





BORING/SAMPLE : B–4 DEPTH (ft) : 1.5–3

DESCRIPTION :

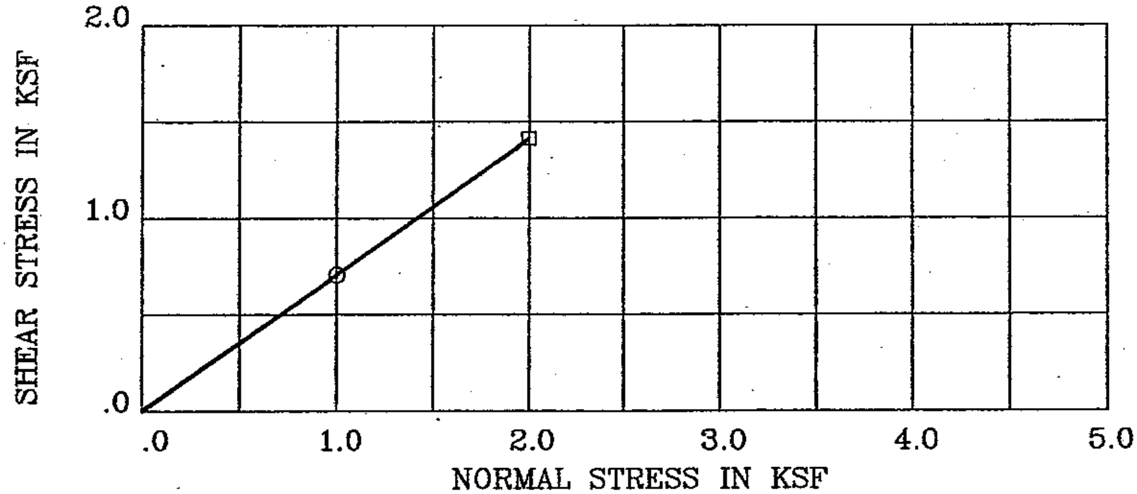
STRENGTH INTERCEPT (C) : .287 KSF

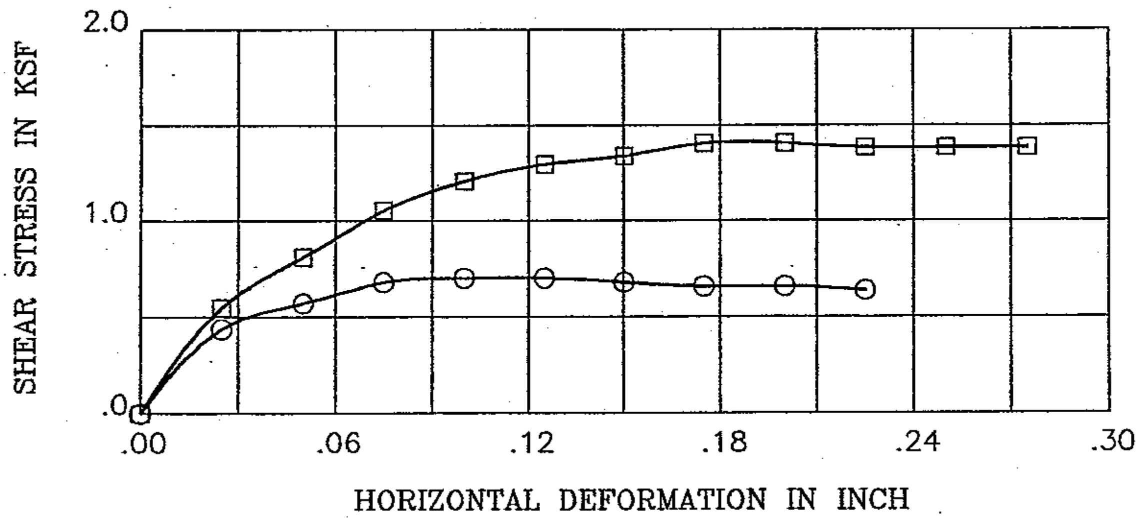
FRICTION ANGLE (PHI) : 21.0 DEG (PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	60.1	66.1	1.501	1.00	.64	.61
□	58.6	68.0	1.433	2.00	1.12	1.12
△	52.3	73.8	1.242	3.00	1.41	1.34

Remark :

D05094.01	Home Depot Huntington Beach
The Twining Labs Inc. Fresno, CA	DIRECT SHEAR TEST Figure No. 10





BORING/SAMPLE : B-14 DEPTH (ft) : 3.0 – 4.5'

DESCRIPTION :

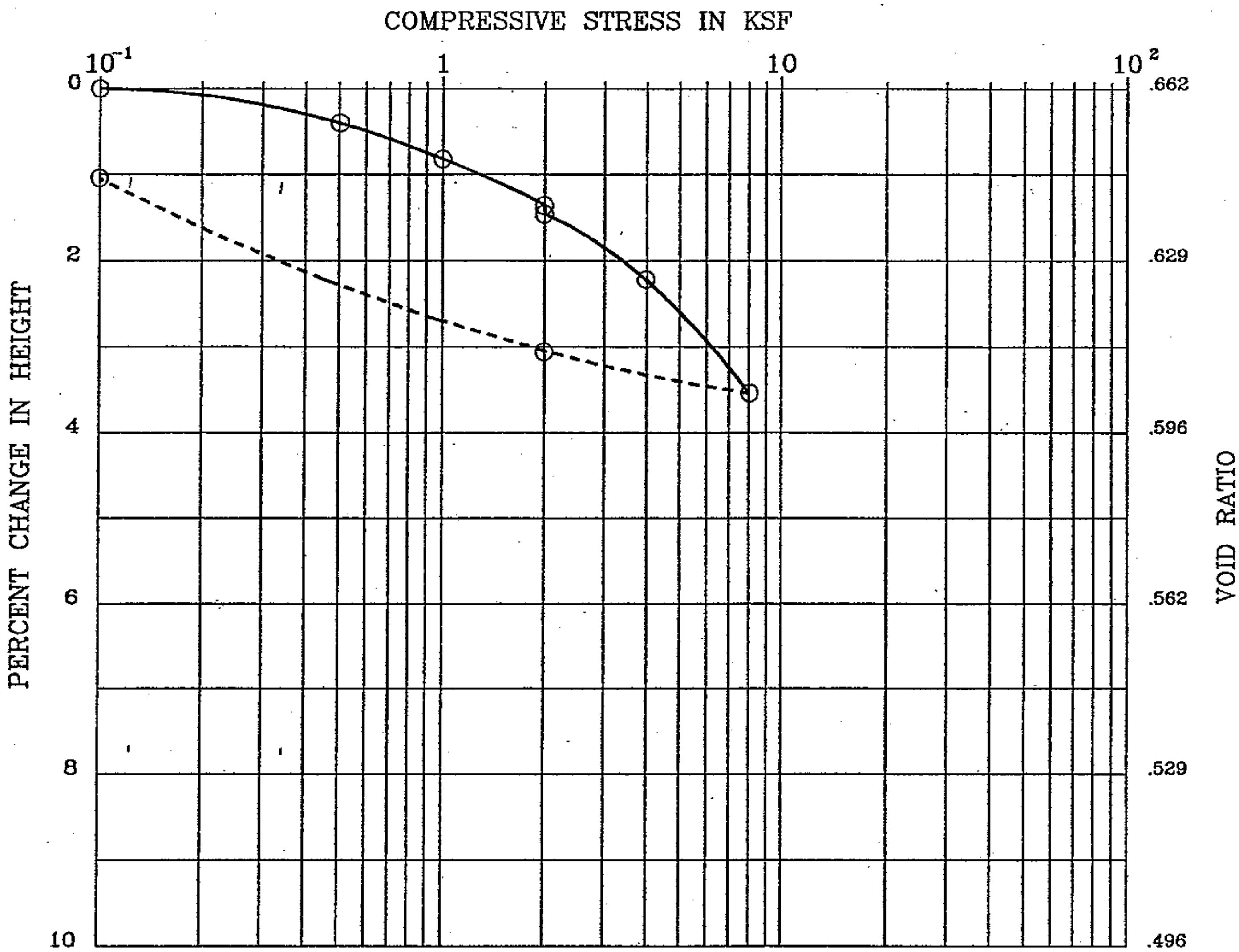
STRENGTH INTERCEPT (C) : .000 KSF (PEAK STRENGTH)

FRICTION ANGLE (PHI) : 35.2 DEG

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	33.4	90.1	.836	1.00	.70	.64
□	34.1	94.8	.745	2.00	1.41	1.38

Remark :

Proj D05094.02	Home Depot Huntington Beach
The Twining Labs Inc. Fresno, CA	DIRECT SHEAR TEST Figure No. 11



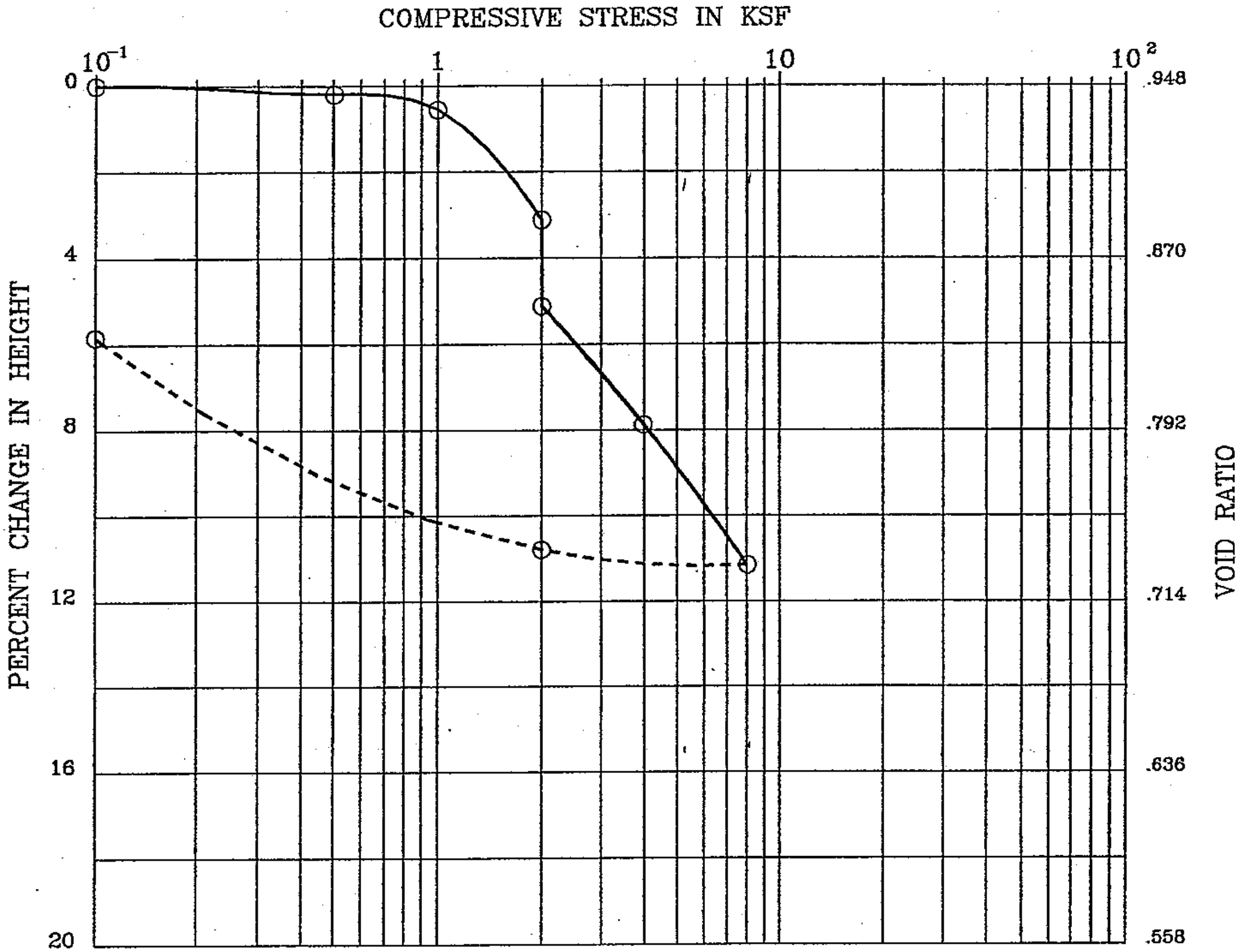
BORING : B-11
DEPTH (ft) : 1.5 – 3.0'
SPEC. GRAVITY : 2.65

DESCRIPTION : SAND
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	17.9	99.6	72	.662
FINAL	24.0	100.7	99	.644

Remark : Saturated at 2 ksf

Proj D05094.02	Home Depot Huntington Beach
The Twining Labs Inc. Fresno, CA	CONSOLIDATION TEST Figure No. 17



BORING : B-14

DEPTH (ft) : 3.0 - 4.5'

SPEC. GRAVITY : 2.65

DESCRIPTION : SAND

LIQUID LIMIT :

PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	8.6	85.0	24	.948
FINAL	31.5	90.2	100	.835

Remark : Saturated at 2 ksf

Proj D05094.02	Home Depot Huntington Beach
The Twining Labs Inc. Fresno, CA	CONSOLIDATION TEST Figure No. 18

EXPANSION INDEX TEST

Uniform Building Code (UBC) 29-2

Project Number: D05094.02

Project: Home Depot Huntington Beach

Sample Location: B-11

Depth: 0 - 3.0'

Date Sampled:

Sampled by: HE

Sample Number	Molding Moisture Content	Final Moisture Content	Dry Density (γ d)
B-11	13.3	29.1	99.3

Initial Thickness: 1.0000

Final Thickness: 1.0473

Expansion Index (EI): 47

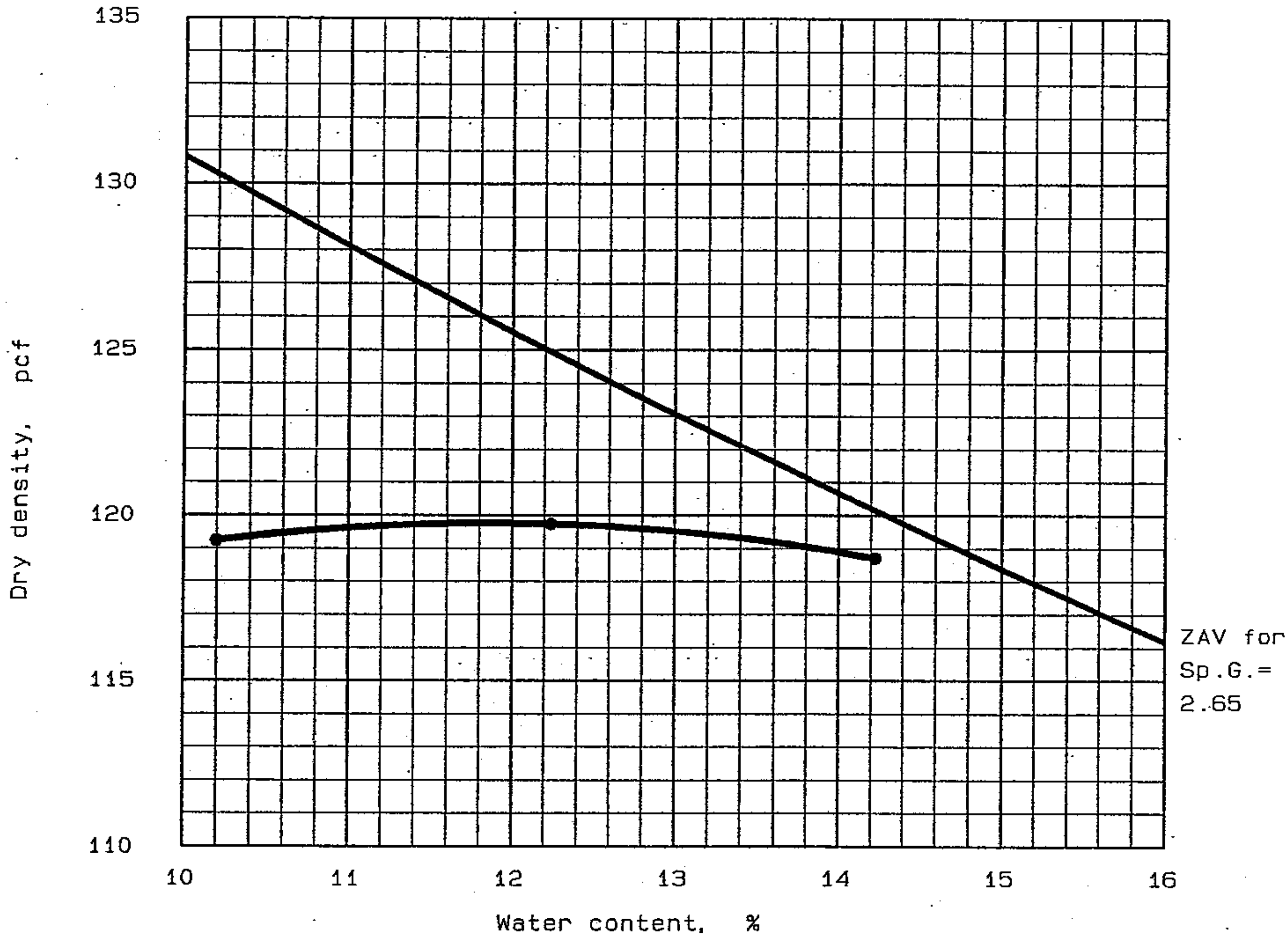
Expansion Soil Classification: Low

TABLE NUMBER 29-C
EXPANSIVE SOIL CLASSIFICATION

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

Figure No.19

PROCTOR TEST REPORT



"Modified" Proctor, ASTM D 1557, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
.5-3				2.65				

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 11.9 % Maximum dry density = 119.8 pcf	

Project No.: D05094.01

Project: Home Depot Huntining Beach

Location: B-6

Date: 07-02-04

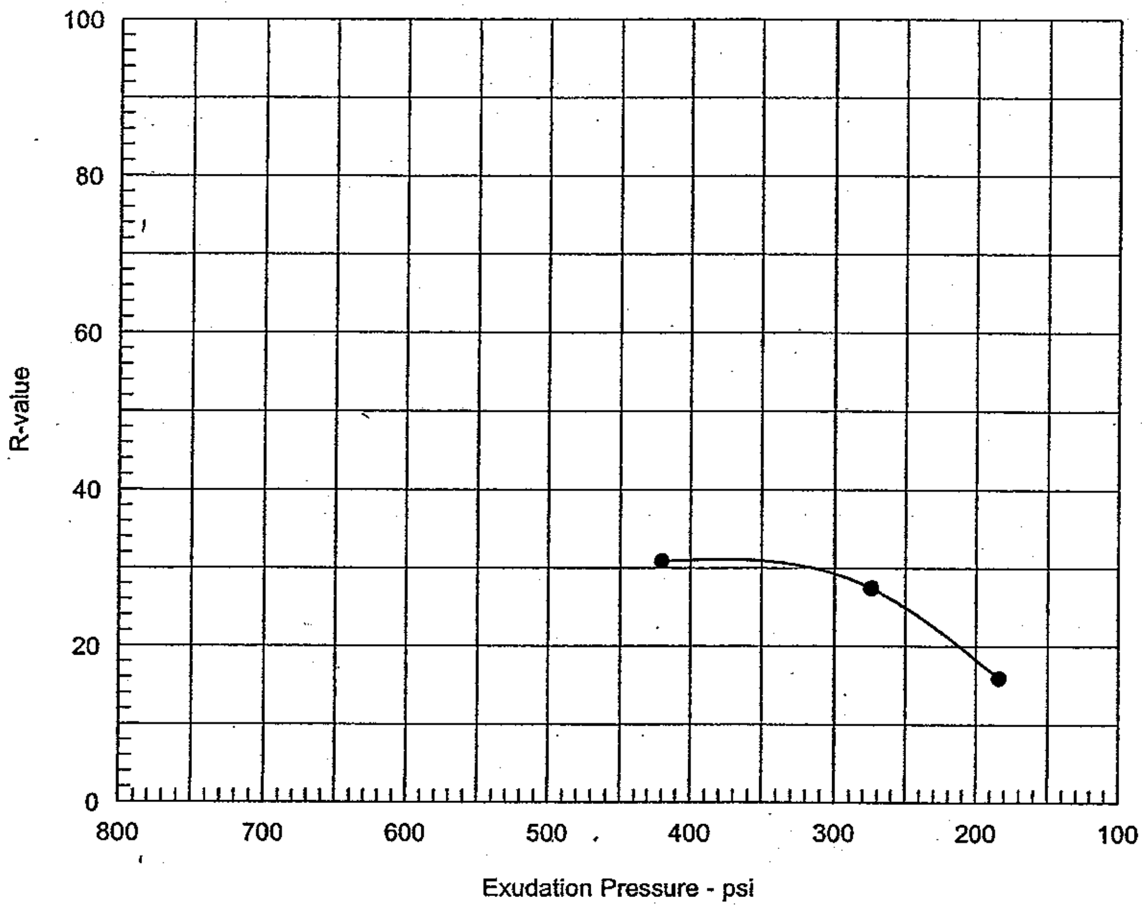
Remarks:

PROCTOR TEST REPORT

THE TWINING LABORATORIES, INC.

Figure No. 20

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Valu Cor
1	275	109.1	18.4	0.00	88	2.51	275	27.4	27.
2	350	110.5	17.5	0.00	83	2.52	420	30.8	30.
3	100	104.6	20.2	0.00	112	2.51	184	15.9	15.

Test Results	Material Description
R-value at 300 psi exudation pressure = 29.3	SILT, Sandy; medium stiff, moist, slightly plastic, grayish brown, trace organic smell

Project No.: D05094.01

Project: Home Depot Remodel

Source of Sample: B-8 **Depth:** 0.7

Date: 7/3/2004

Tested by: Degol M

Checked by: Joe S

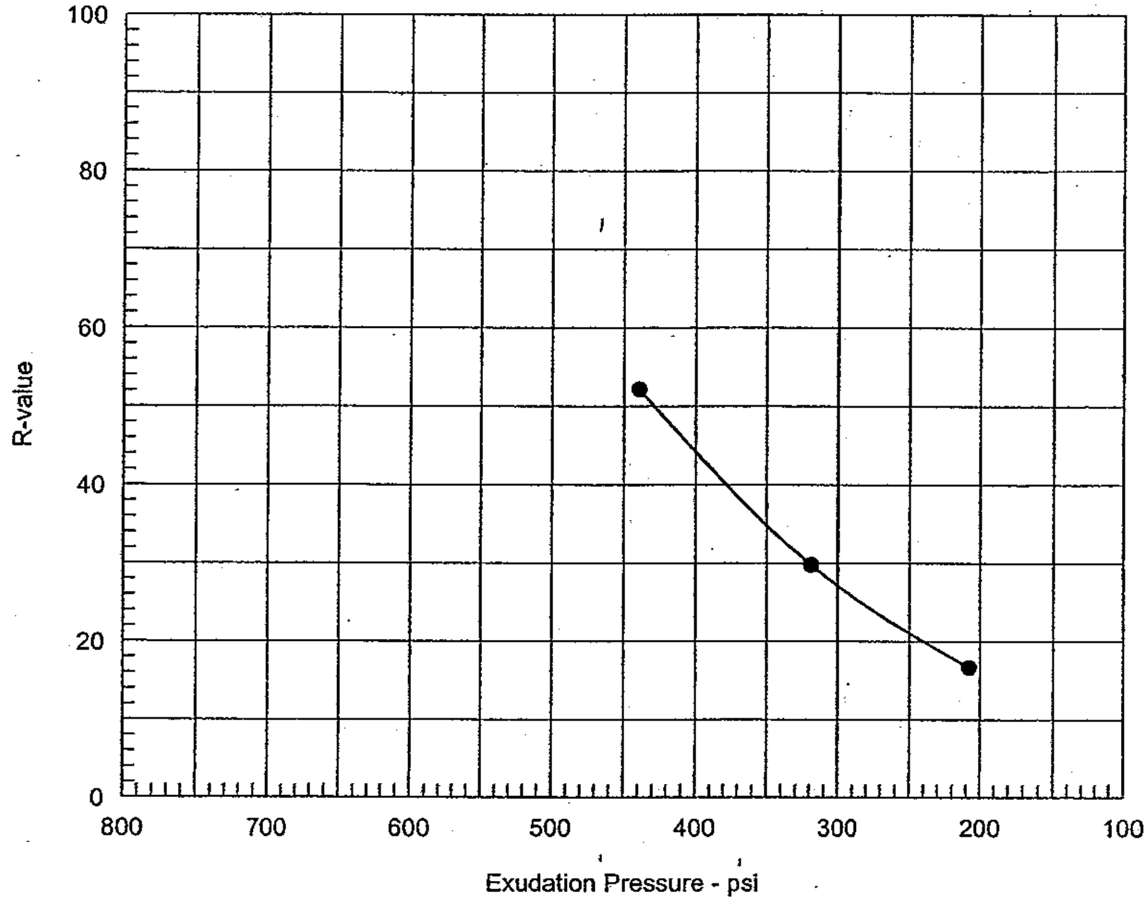
Remarks:

R-VALUE TEST REPORT

THE TWINING LABORATORIES, INC.

Figure No. 21

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Valu Cor
1	125	123.4	0.0	0.00	110	2.64	208	15.2	16.
2	300	124.6	0.0	0.00	81	2.51	319	29.8	29.
3	350	127.0	0.0	0.00	50	2.50	439	52.1	52.

Test Results	Material Description
R-value at 300 psi exudation pressure = 27.1	SAND, Silty; medium dense, damp, slight plasticity, olive brown, with tr clay

Project No.: D05094.01

Project: Home Depot Remodel

Source of Sample: B-1 **Depth:** 0.5

Date: 7/3/2004

Tested by: Degol M

Checked by: Joe S

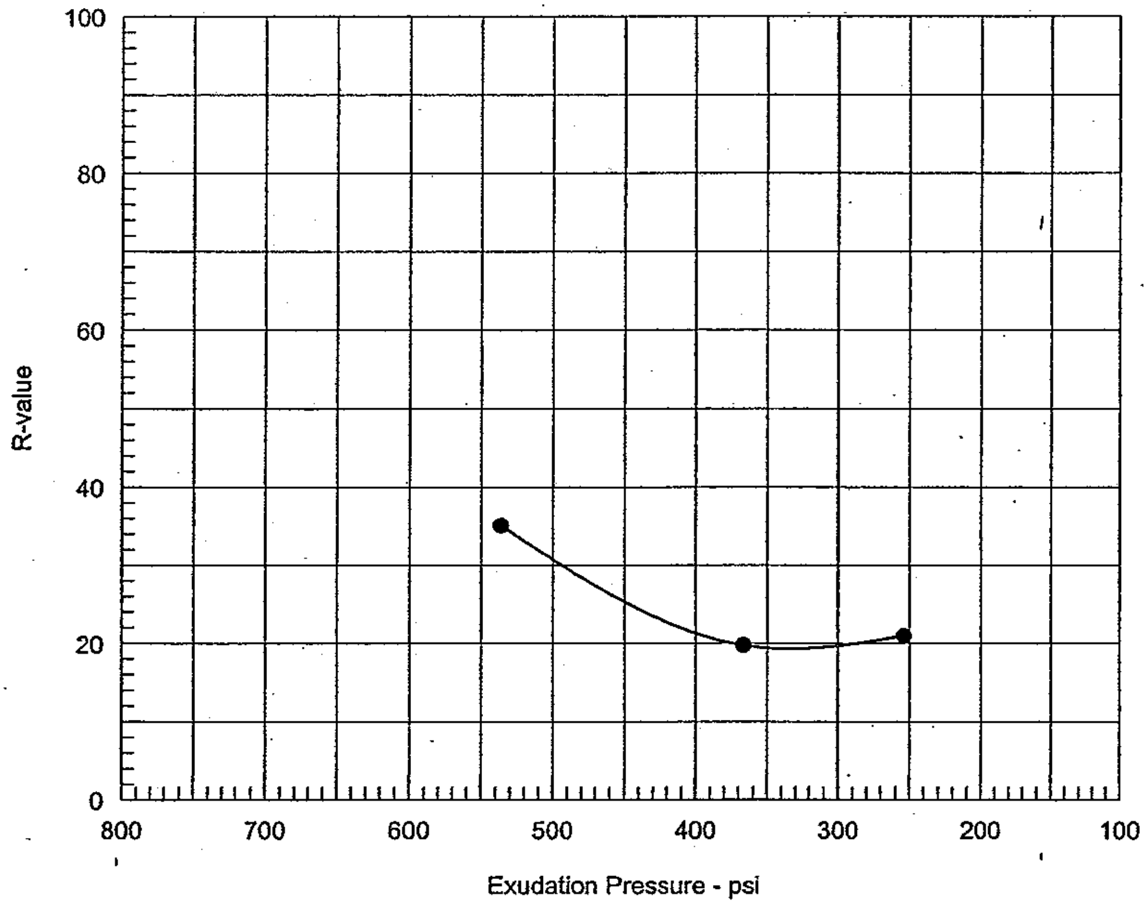
Remarks:

R-VALUE TEST REPORT

THE TWINING LABORATORIES, INC.

Figure No. 22

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Valu Cor
1	250	114.4	15.5	0.00	96	2.39	367	21.3	19.
2	135	112.6	16.4	0.00	106	2.49	254	20.9	20.
3	350	117.5	14.6	0.00	79	2.40	536	37.5	35.

Test Results	Material Description
R-value at 300 psi exudation pressure = 19.7	SILT, Sandy; stiff, moist, slightly plastic, brown

Project No.: D05094.01

Project: Home Depot Remodel

Source of Sample: B-6 **Depth:** 0.5

Date: 7/3/2004

Tested by: Degol M

Checked by: Joe S

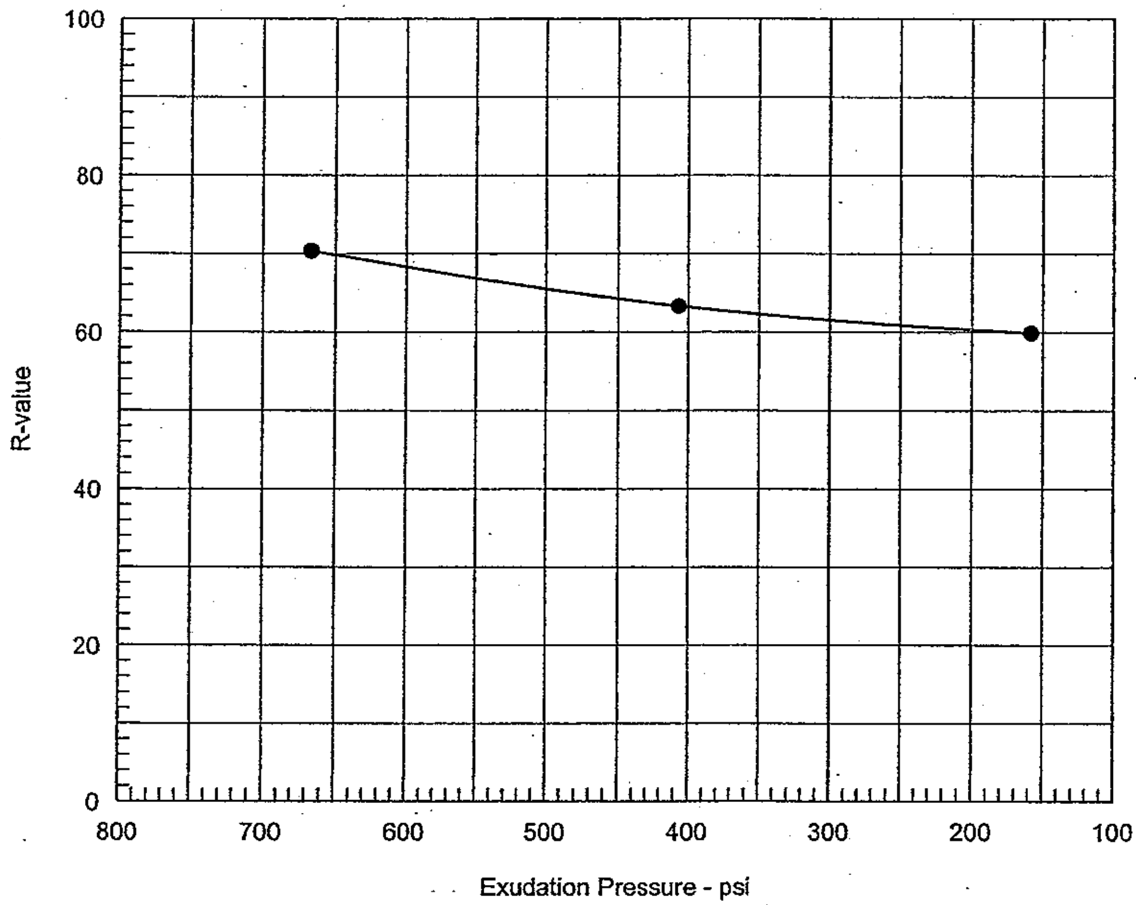
Remarks:

R-VALUE TEST REPORT

THE TWINING LABORATORIES, INC.

Figure No. 23

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Valu Cor
1	350	111.3	15.1	0.00	43	2.55	158	59.9	59.
2	150	112.3	14.2	0.00	32	2.51	667	70.3	70.
3	155	111.7	14.6	0.00	39	2.51	407	63.3	63.

Test Results	Material Description
R-value at 300 psi exudation pressure = 61.5	SAND, Silty; loose, damp, light brow to dark brown, with trace clay

Project No.: D05094.01

Project: Home Depot Remodel

Source of Sample: B-10 **Depth:** 0.6

Date: 7/3/2004

Tested by: Degol M

Checked by: Joe S

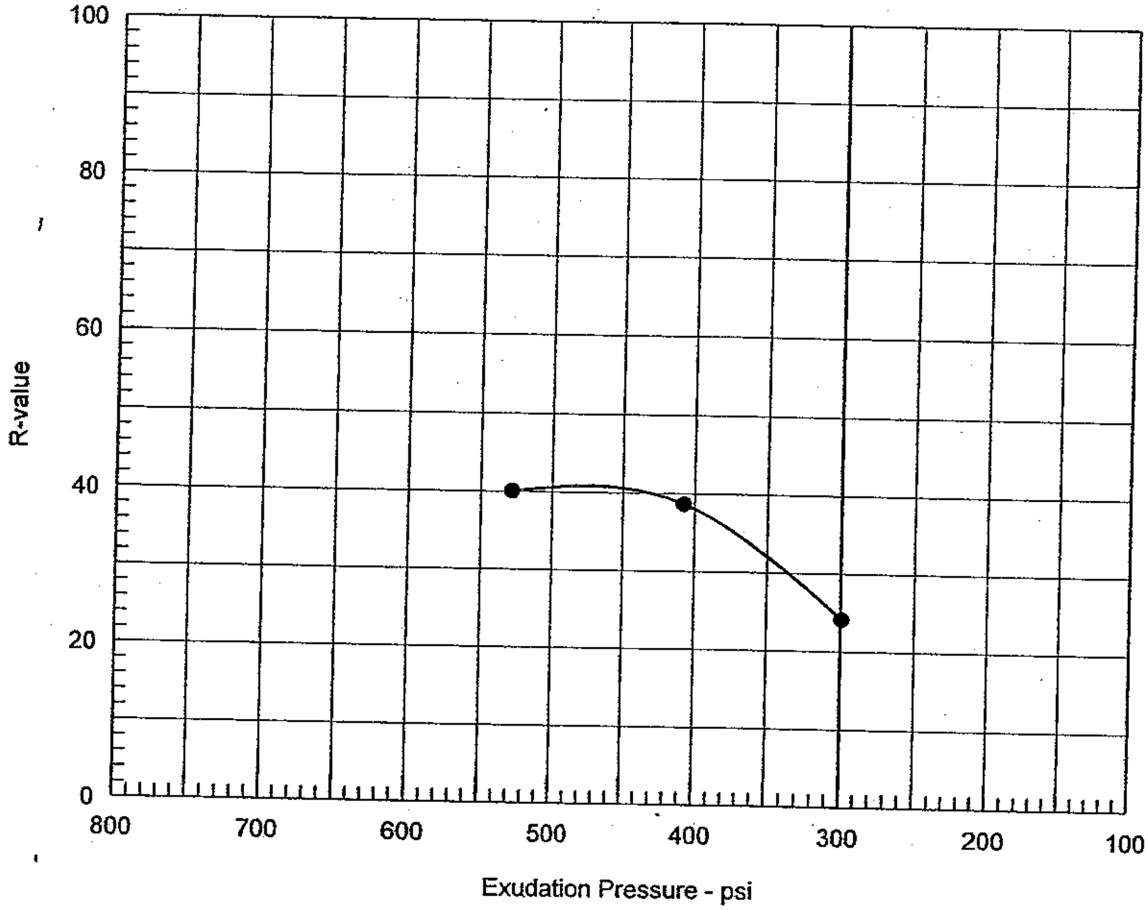
Remarks:

R-VALUE TEST REPORT

THE TWINING LABORATORIES, INC.

Figure No. 24

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	100	99.2	24.6	0.00	60	2.69	528	35.7	40.1
2	100	98.0	25.6	0.00	88	2.70	299	21.2	24.1
3	100	99.8	24.1	0.00	61	2.68	407	34.6	38.7

Test Results	Material Description
R-value at 300 psi exudation pressure = 24.2	

Project No.: D05094.02
Project: Home Depot
Location: Huntington Beach
Sample Number: B-22 **Depth:** 0 - 3.0'
Date: 11/24/2004

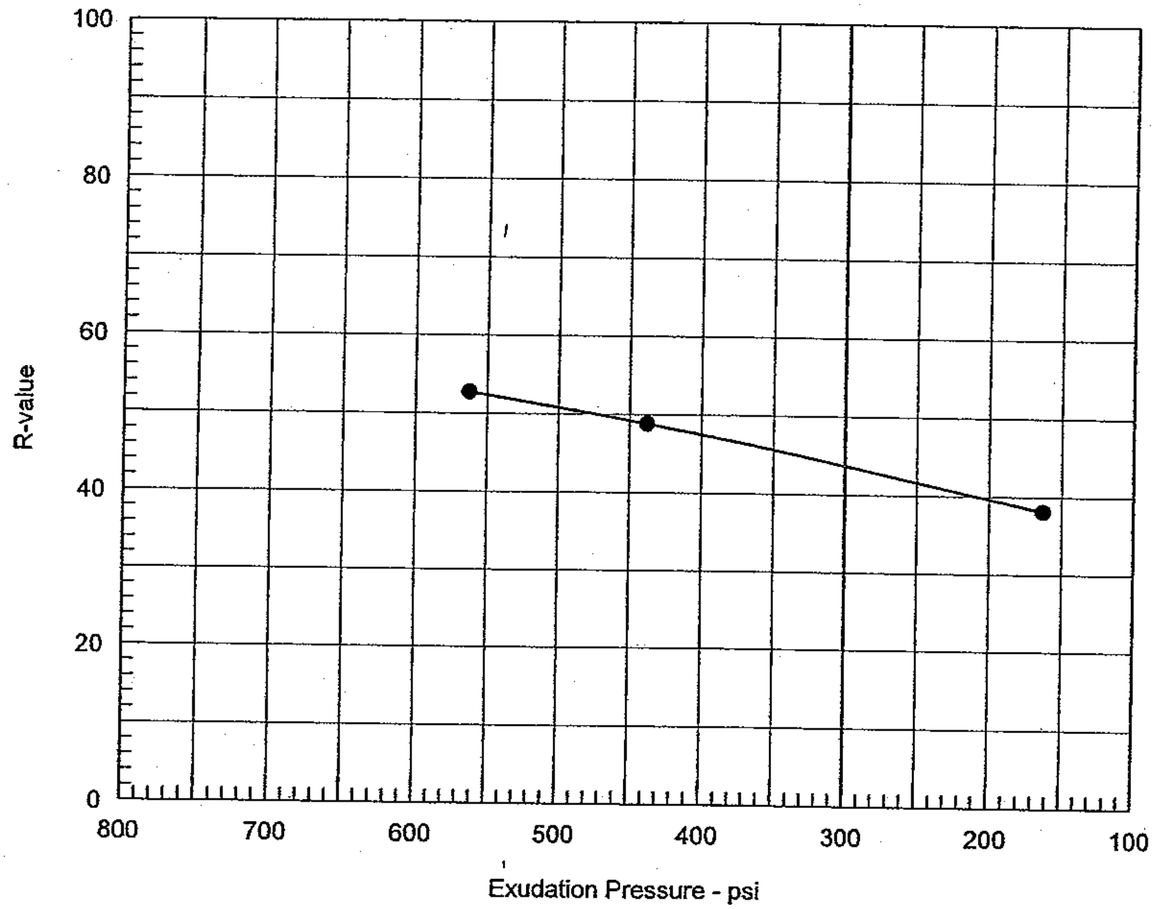
Tested by: David Suderman
Checked by: Barry Annis
Remarks:

R-VALUE TEST REPORT

THE TWINING LABORATORIES, INC.

Figure No. 25

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	100	106.6	19.0	0.00	41	2.62	438	45.7	48.8
2	150	102.2	20.4	0.00	60	2.70	163	33.7	38.1
3	150	105.6	18.0	0.00	38	2.67	563	48.2	52.7

Test Results	Material Description
R-value at 300 psi exudation pressure = 43.7	

Project No.: D05094.02

Project: Home Depot

Location: Huntington Beach

Sample Number: B-24 **Depth:** 0 - 3.0'

Date: 11/24/2004

Tested by: David Suderman

Checked by: Barry Annis

Remarks:

R-VALUE TEST REPORT

THE TWINING LABORATORIES, INC.

Figure No. 26

THE TWINING LABORATORIES, INC.
EST. 1898
CALIFORNIA ELAP CERTIFICATE #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

June 30, 2004

Work Order #: 4F25001

Jim Kellogg
Twining Geotechnical Department
2527 Fresno Street
Fresno, CA 93721

RE: K-Mart Remodel (Home Depot)-Huntington Beach

Enclosed are the analytical results for samples received by our laboratory on 06/25/04 . For your reference, these analyses have been assigned laboratory work order number 4F25001.

All analysis have been performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, The Twining Laboratories, Inc. (TL) is not responsible for use of less than complete reports. Results apply only to samples analyzed.

If you have any questions, please feel free to contact us at the number listed above.

Sincerely,

The Twining Laboratories, Inc.

Ronald J. Boquist
Director of Analytical Chemistry

Figure No. 27

THE TWINING LABORATORIES, INC.
EST. 1898
CALIFORNIA ELAP CERTIFICATE #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

Twining Geotechnical Department 2527 Fresno Street	Project: K-Mart Remodel (Home Depot)-Huntington Beach Project Number: D05094.01	Reported:
Fresno CA, 93721	Project Manager: Jim Kellogg	06/30/04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B-1@0.5-3'	4F25001-01	Soil	06/17/04 00:00	06/25/04 09:21
B-6@1.5-3'	4F25001-02	Soil	06/17/04 00:00	06/25/04 09:21

The Twining Laboratories Inc.

Ronald J. Boquist, Director of Analytical Chemistry
Joseph A. Ureno, Quality Assurance Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

THE TWINING LABORATORIES, INC.
EST. 1898
CALIFORNIA ELAP CERTIFICATE #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

Twining Geotechnical Department 2527 Fresno Street Fresno CA, 93721	Project: K-Mart Remodel (Home Depot)-Huntington Beach Project Number: D05094.01 Project Manager: Jim Kellogg	Reported: 06/30/04

B-1@0.5-3' (sampled: 06/17/2004)
4F25001-01 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics								
Chloride	**61**	6.0	mg/kg	3	T4F2810	06/28/04	06/28/04	ASTM D-4327-84
Chloride	**0.0061**	0.00060	% by Weight	3	[CALC]	06/28/04	06/28/04	ASTM D4327-84
Sulfate as SO4	**0.018**	0.00060	% by Weight	3	[CALC]	06/28/04	06/28/04	ASTM D4327-84
pH	**7.7**		pH Units	3	T4F2810	06/28/04	06/28/04	ATSM D4972-89 Mod
Resistivity	**2600**		ohms/cm	3	T4F2810	06/28/04	06/28/04	ASTM D1125-82
Sulfate as SO4	**180**	6.0	mg/kg	3	T4F2810	06/28/04	06/28/04	ASTM D4327-84

The Twining Laboratories Inc.

Ronald J. Boquist, Director of Analytical Chemistry
Joseph A. Ureno, Quality Assurance Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

THE TWINING LABORATORIES, INC.
EST. 1898
CALIFORNIA ELAP CERTIFICATE #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
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Twining Geotechnical Department 2527 Fresno Street	Project: K-Mart Remodel (Home Depot)-Huntington Beach Project Number: D05094.01	Reported:
Fresno CA, 93721	Project Manager: Jim Kellogg	06/30/04

B-6@1.5-3' (sampled: 06/17/2004)
4F25001-02 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics								
Chloride	**44**	6.0	mg/kg	3	T4F2810	06/28/04	06/28/04	ASTM D-4327-84
Chloride	**0.0044**	0.00060	% by Weight	3	[CALC]	06/28/04	06/28/04	ASTM D4327-84
Sulfate as SO4	**0.019**	0.00060	% by Weight	3	[CALC]	06/28/04	06/28/04	ASTM D4327-84
pH	**7.7**		pH Units	3	T4F2810	06/28/04	06/28/04	ATSM D4972-89 Mod
Resistivity	**2100**		ohms/cm	3	T4F2810	06/28/04	06/28/04	ASTM D1125-82
Sulfate as SO4	**190**	6.0	mg/kg	3	T4F2810	06/28/04	06/28/04	ASTM D4327-84

Notes and Definitions

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

RPD Relative Percent Difference

Quality Control Data Available Upon Request

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